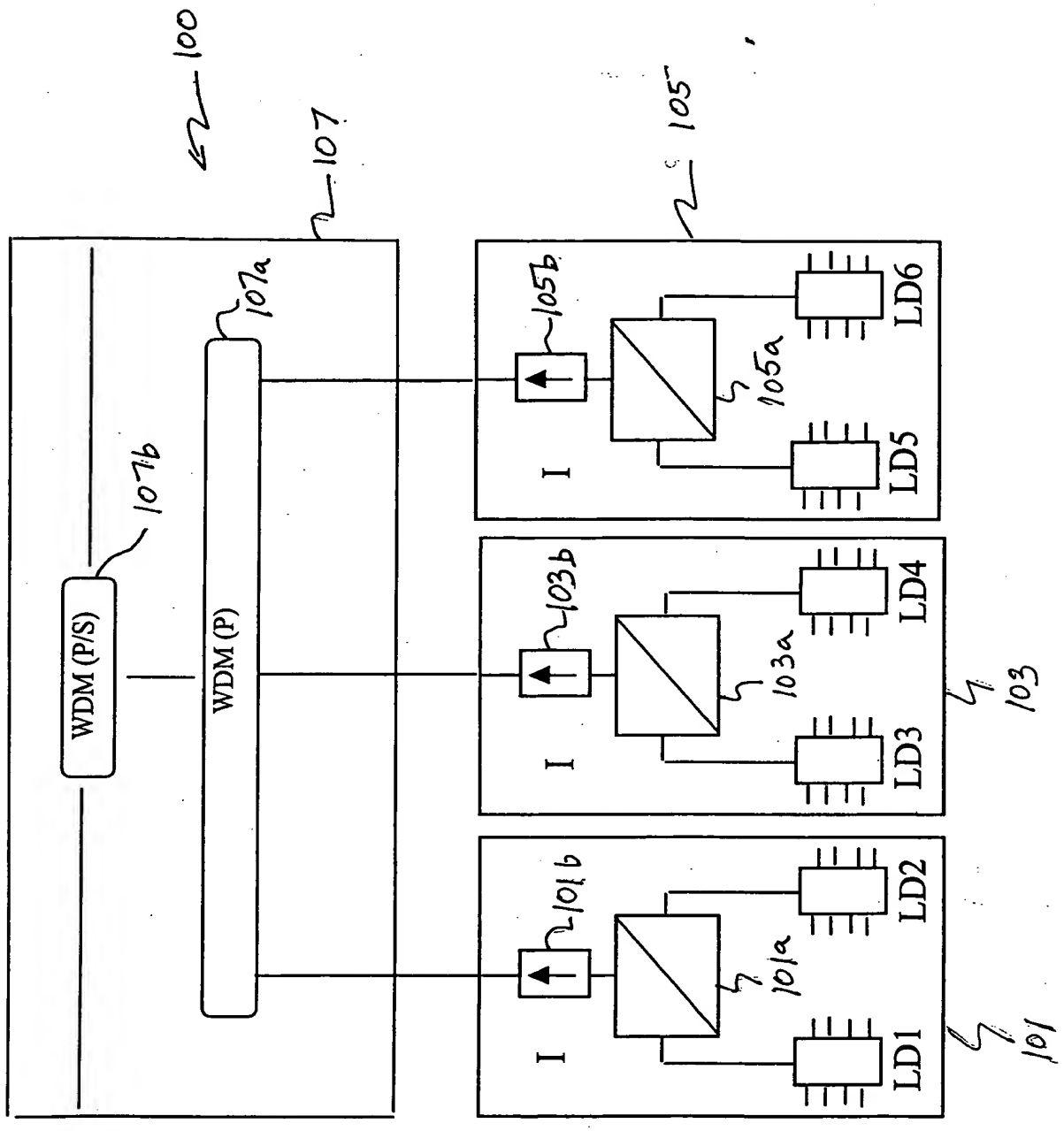
100
107
105
107a
107b
WDM (P/S)
WDM (P)
105b
105a
LD6
LD5
I
103b
103a
LD4
LD3
103
101b
101a
LD2
LD1
101

FIG. 1

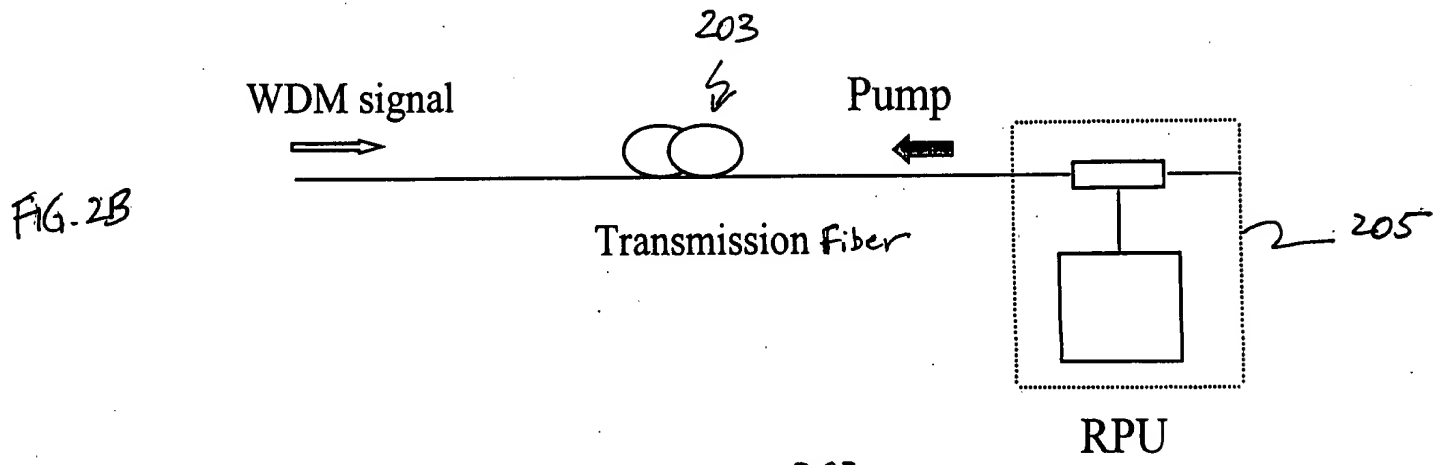

FIG. 2B

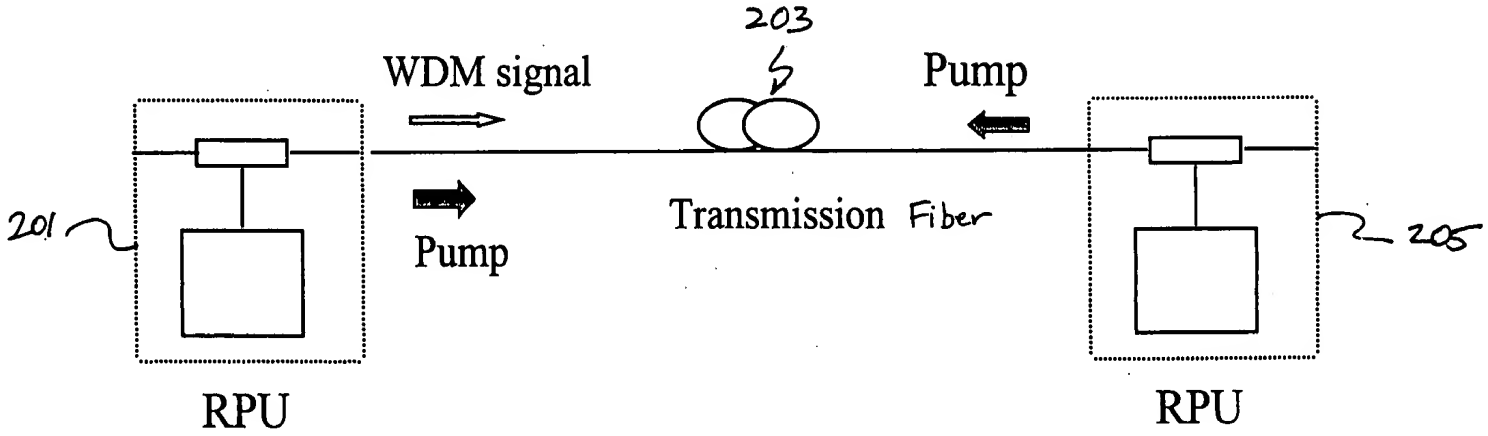

FIG. 2C

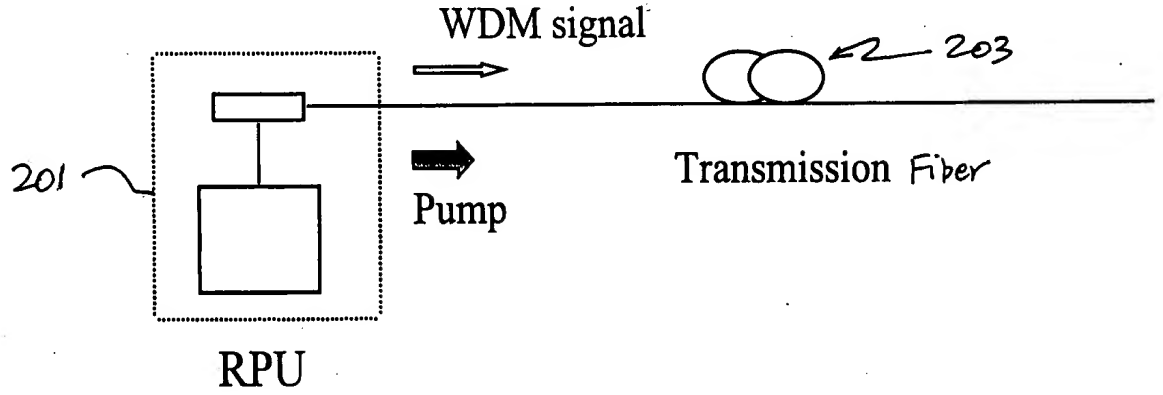

FIG. 2A

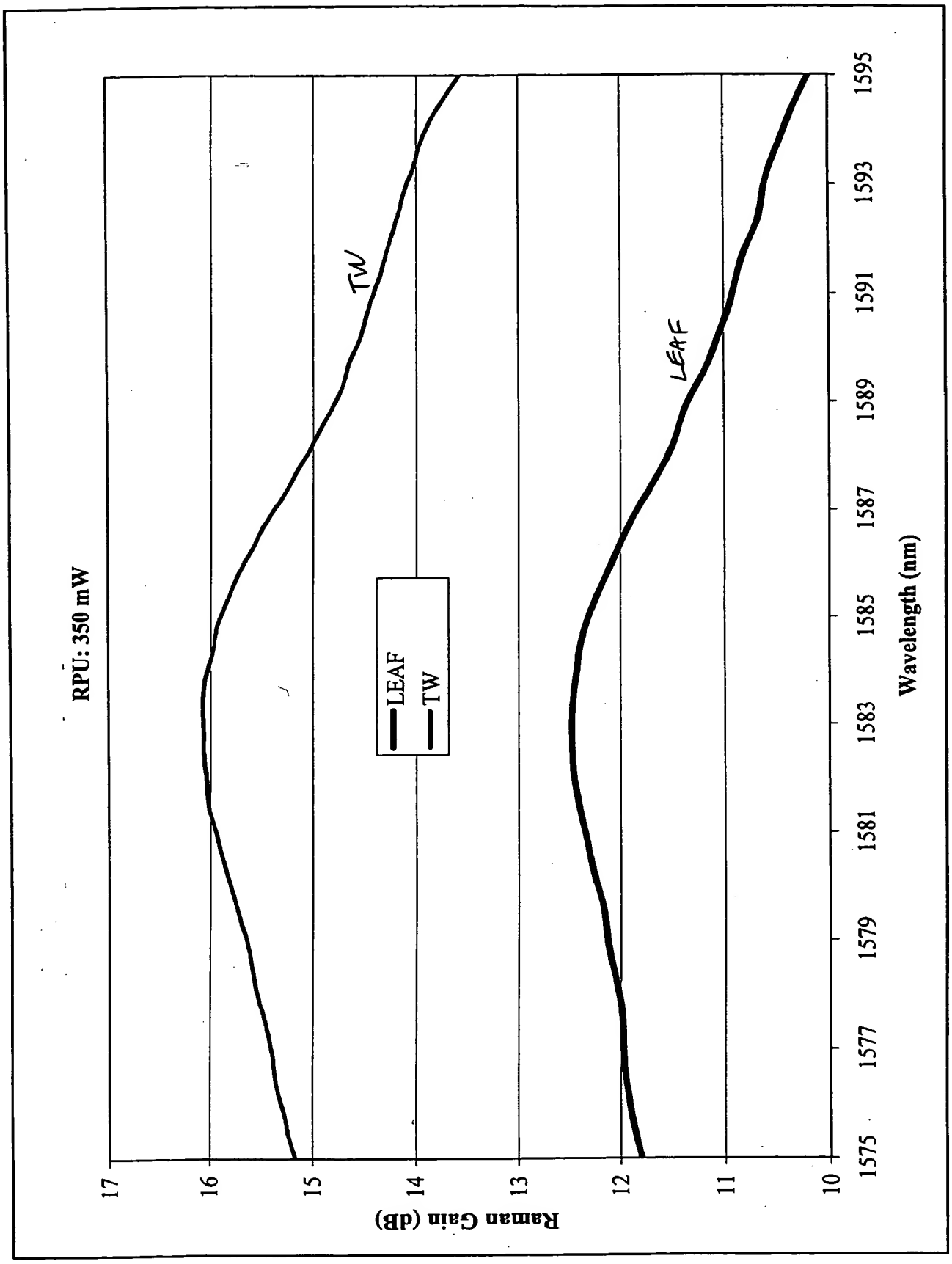

FIG. 3

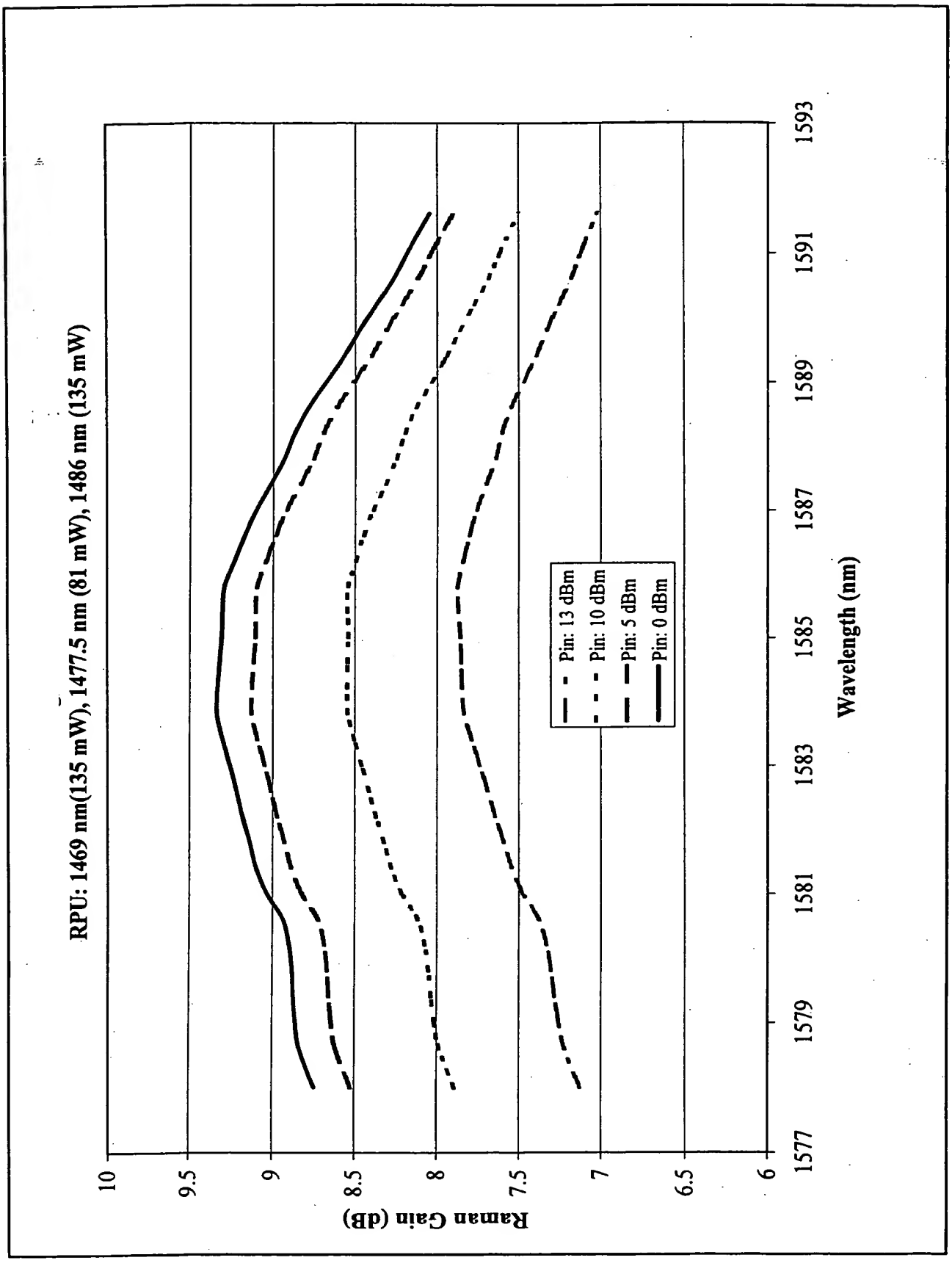
RPU: 1469 nm(135 mW), 1477.5 nm (81 mW), 1486 nm (135 mW)
Raman Gain (dB)
10
9.5
9
8.5
8
7.5
7
6.5
6
1577
1579
1581
1583
1585
1587
1589
1591
1593
Wavelength (nm)
Pin: 13 dBm
Pin: 10 dBm
Pin: 5 dBm
Pin: 0 dBm

FIG. 4

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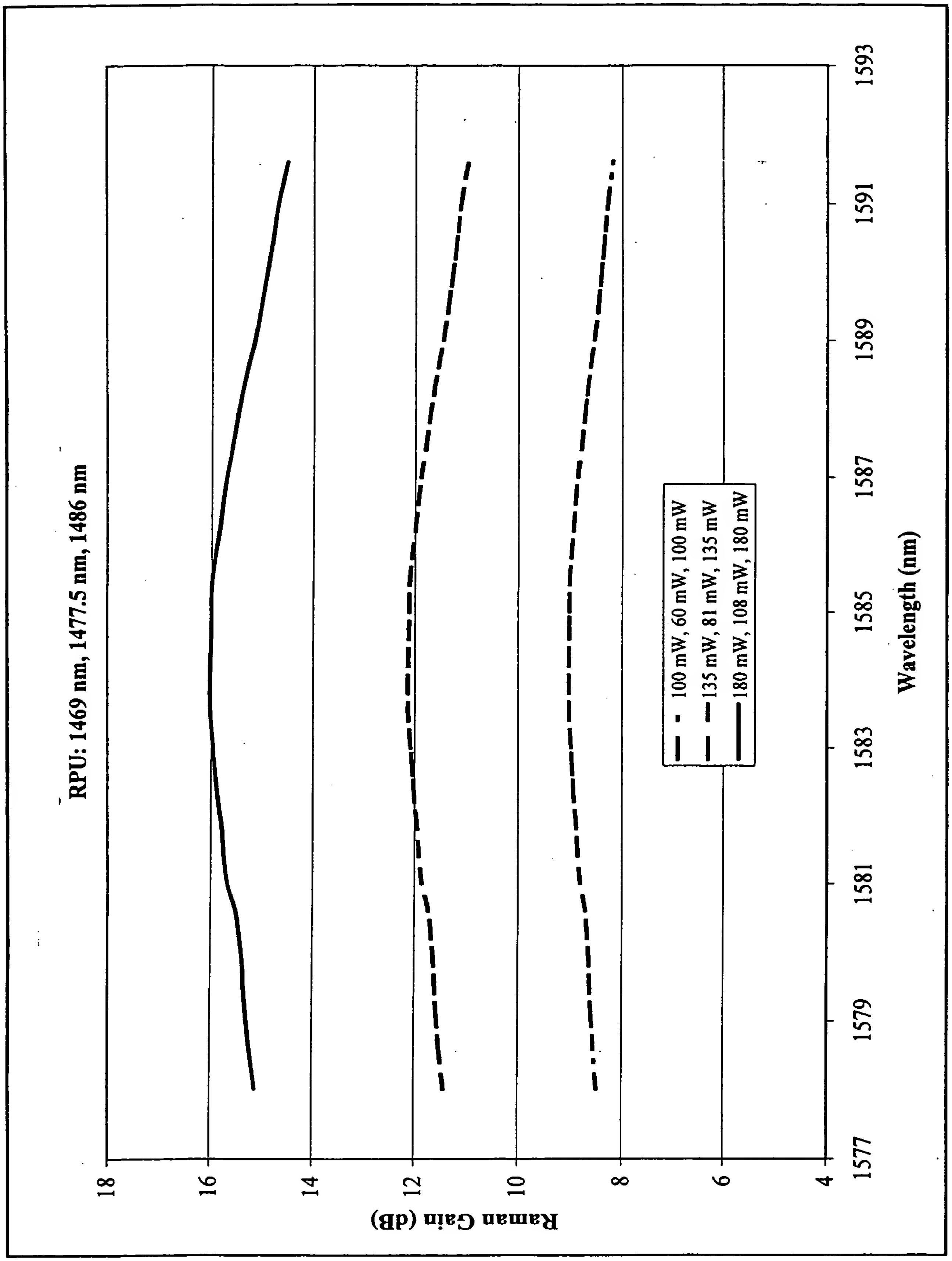

FIG. 5

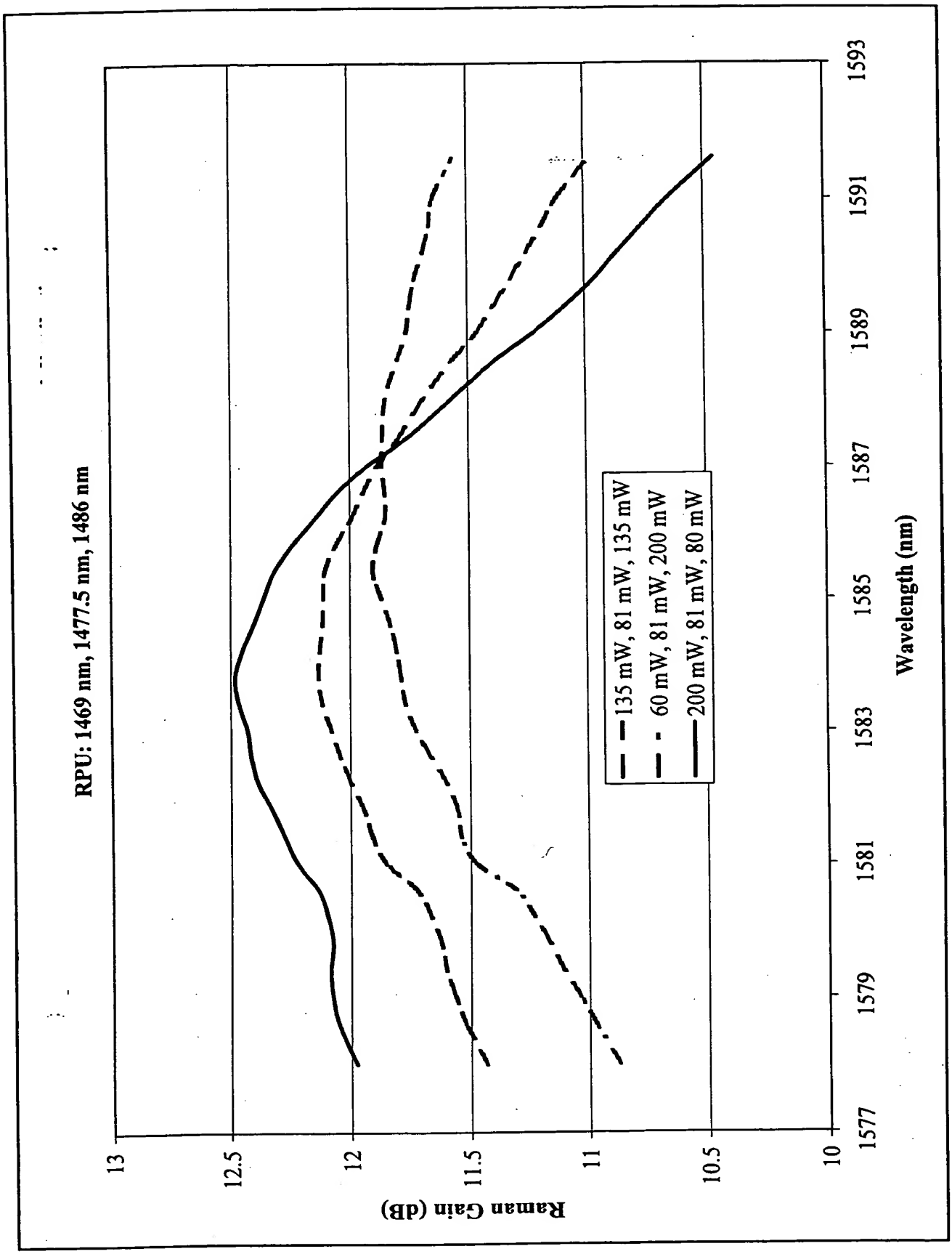
RPU: 1469 nm, 1477.5 nm, 1486 nm
135 mW, 81 mW, 135 mW
60 mW, 81 mW, 200 mW
200 mW, 81 mW, 80 mW
Raman Gain (dB)
13
12.5
12
11.5
11
10.5
10
1577
1579
1581
1583
1585
1587
1589
1591
1593
Wavelength (nm)

FIG. 6

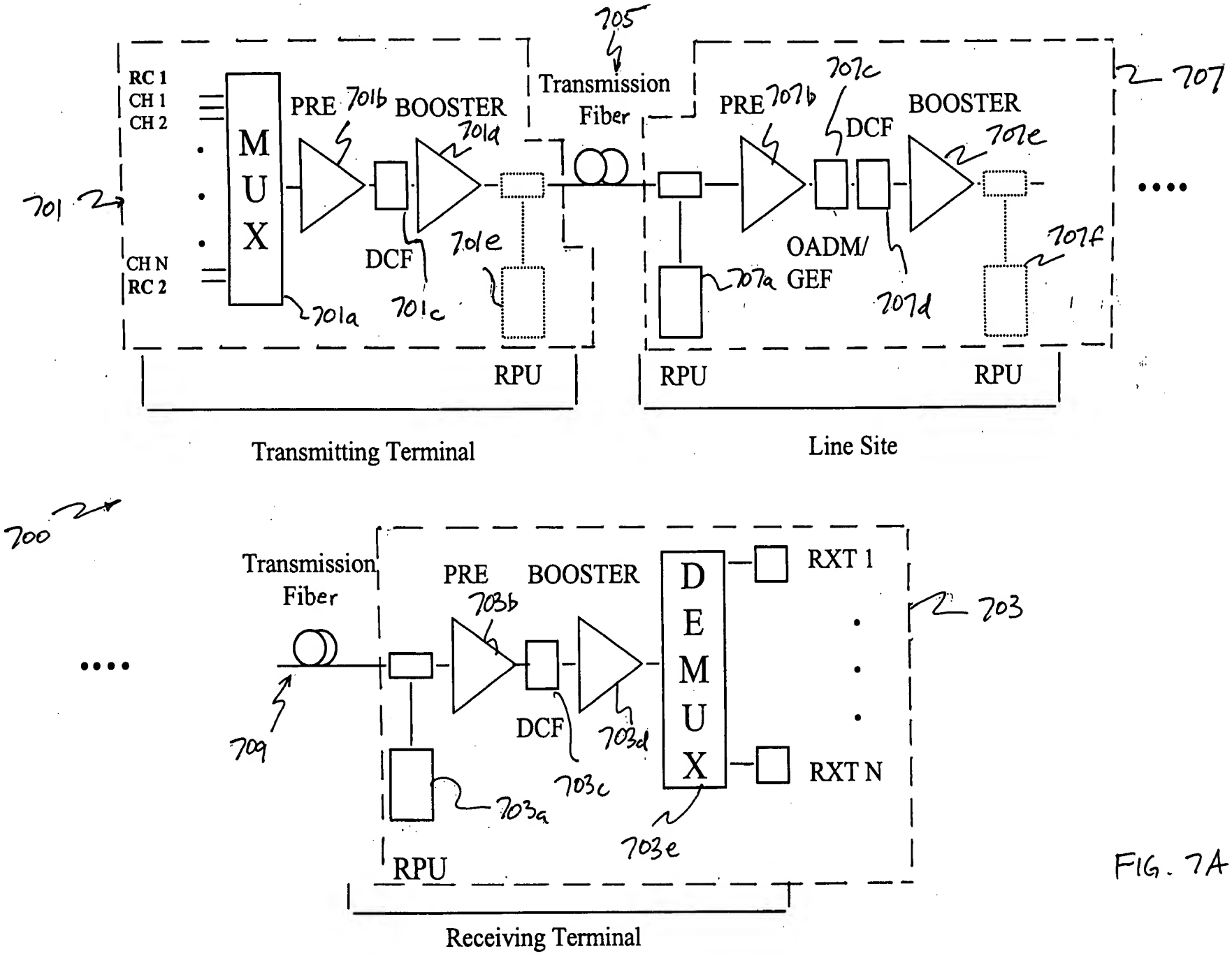

FIG. 7A

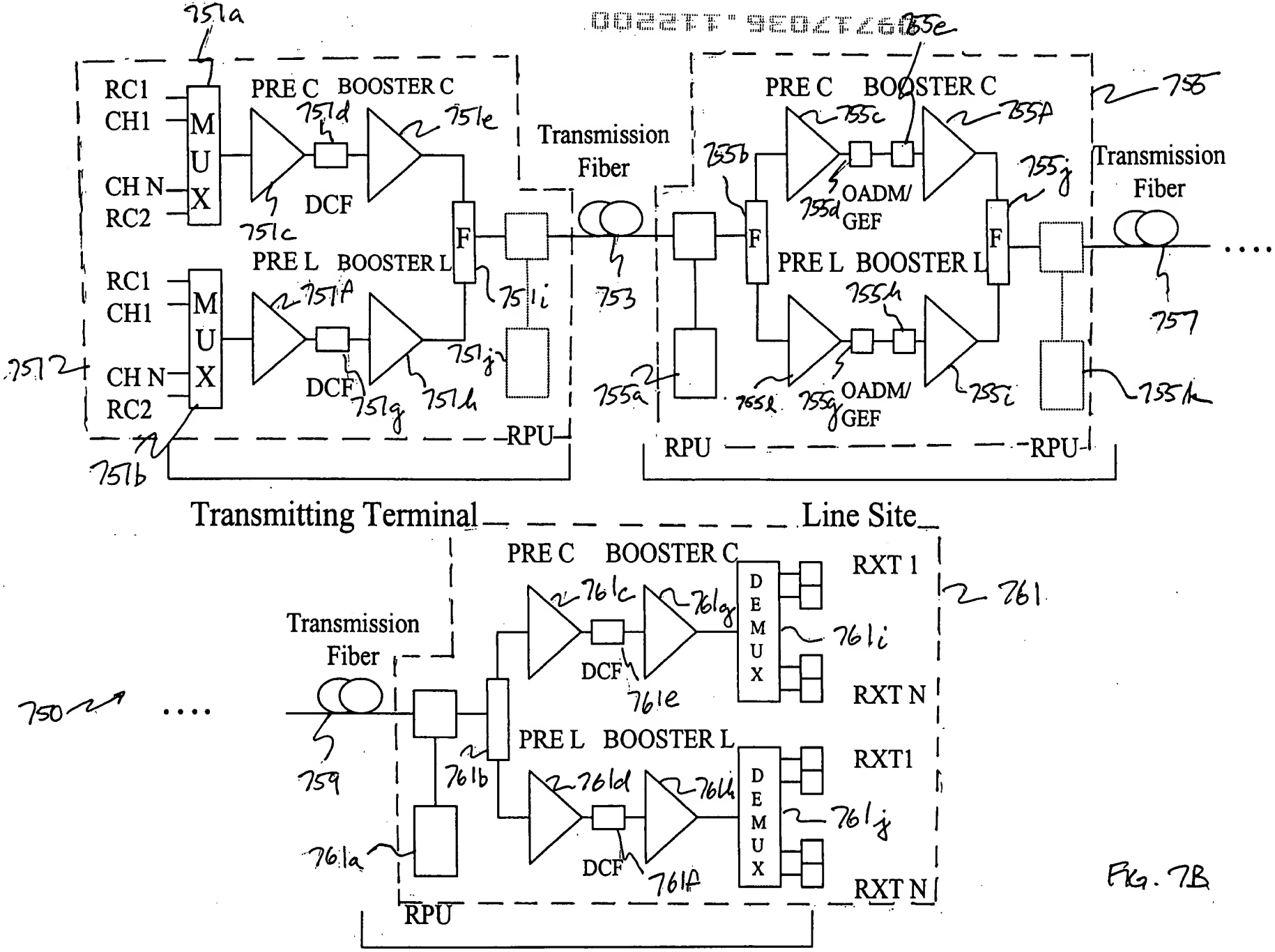

Fig. 7B

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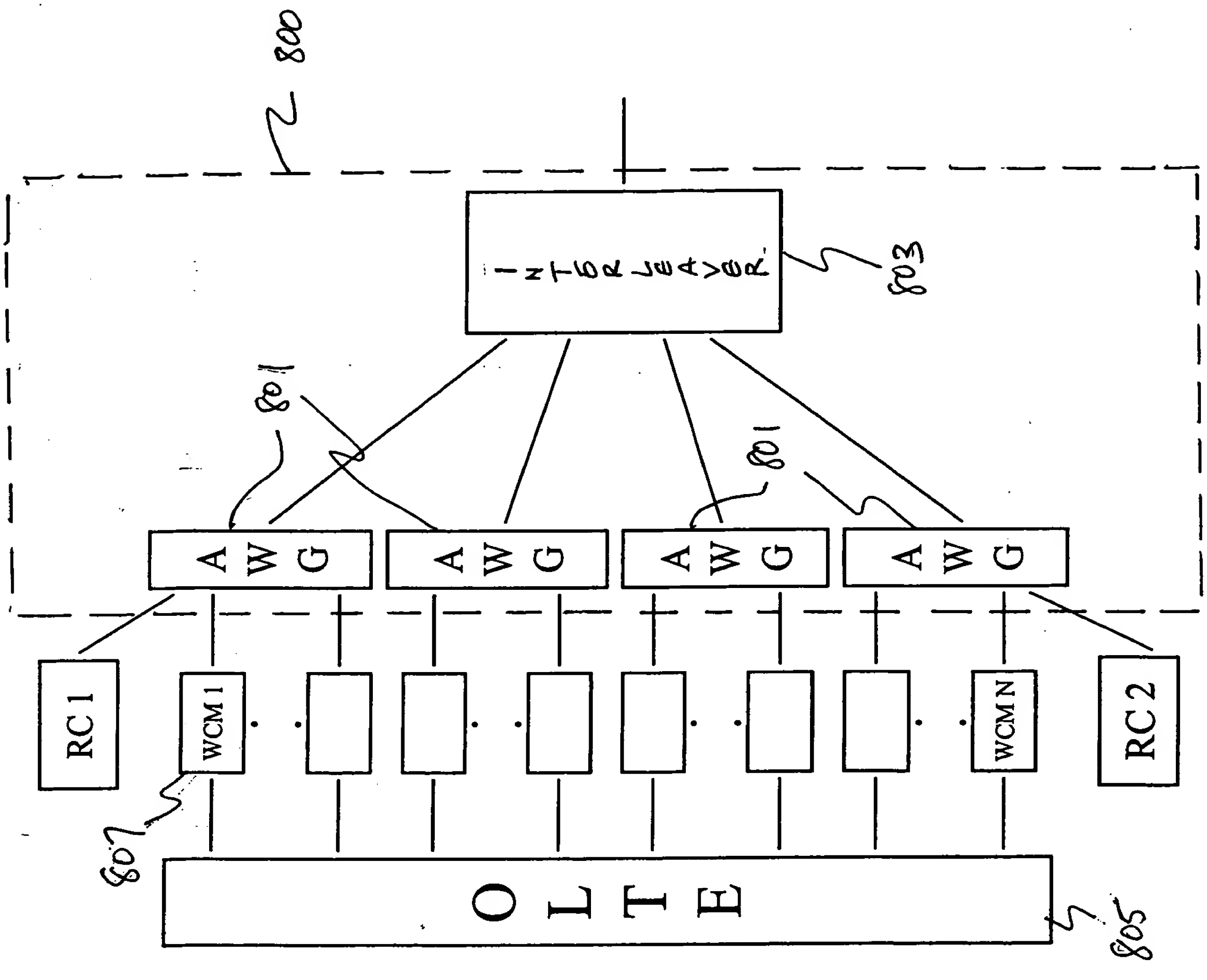
FIG. 8


800
INTERLEAVER
803
801
801
AWG
AWG
AWG
AWG
RC 1
WCM 1
WCM N
RC 2
807
OLTE
805

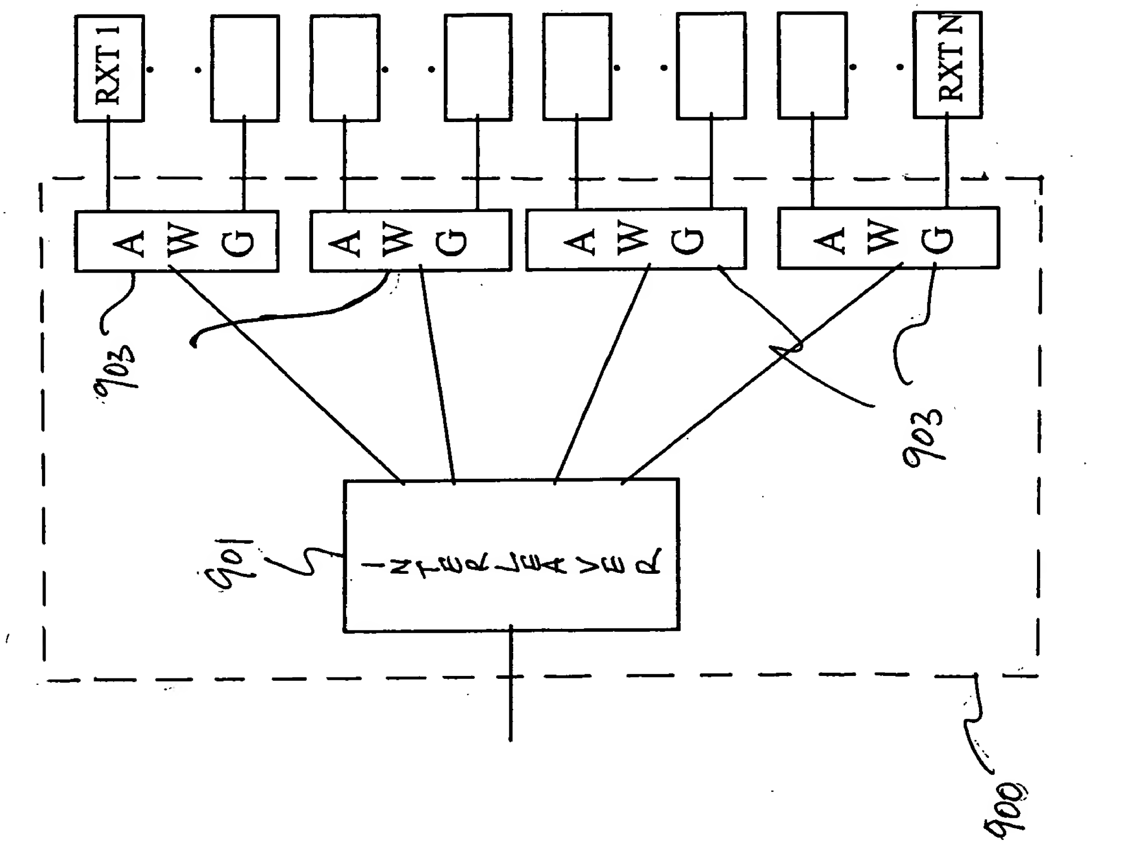


FIG. 9

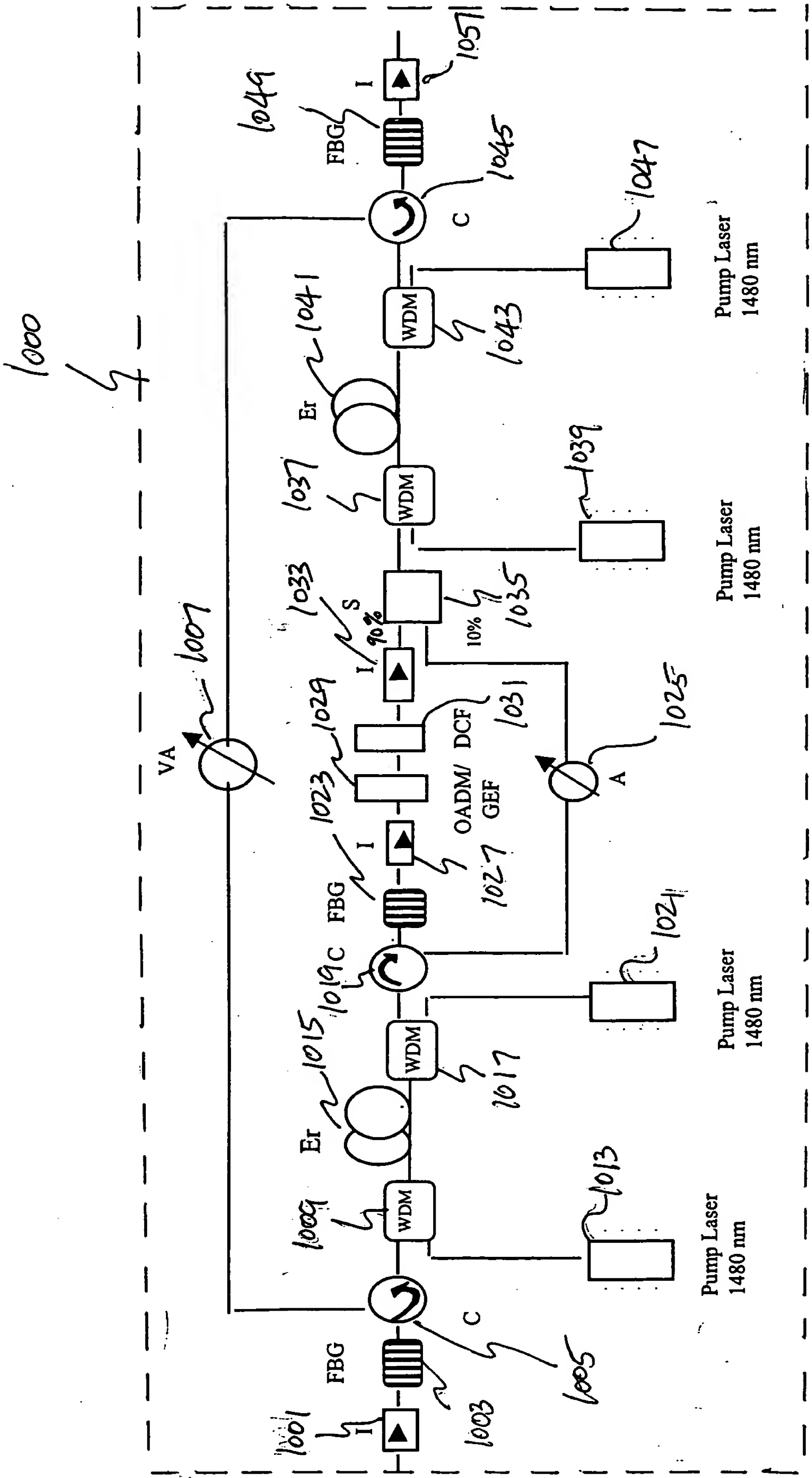

1000
FBG
C
WDM
Er
Pump Laser
1480 nm
VA
A
I
S
90%
10%
OADM/
GEF
DCF
1001
1003
1005
1007
1009
1013
1015
1017
1019
1021
1023
1025
1027
1029
1031
1033
1035
1037
1039
1041
1043
1045
1047
1049
1051

FIG. 10

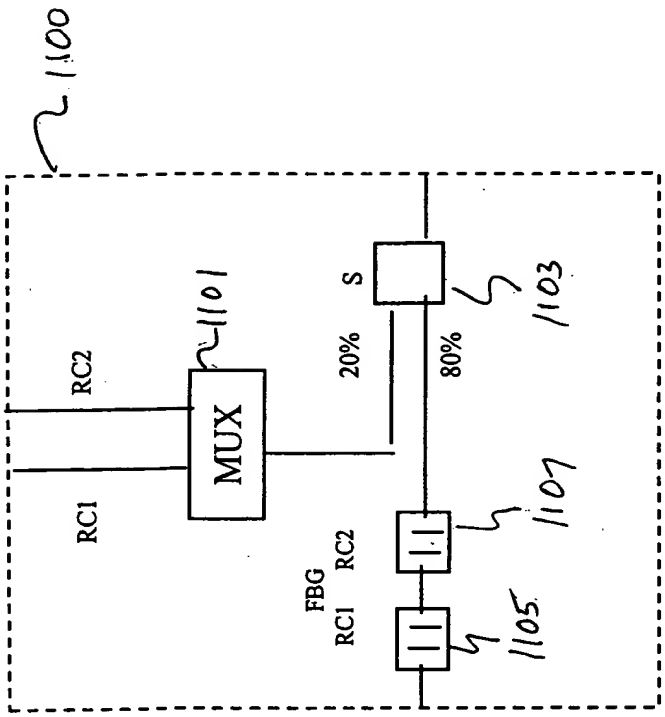


FIG. 11

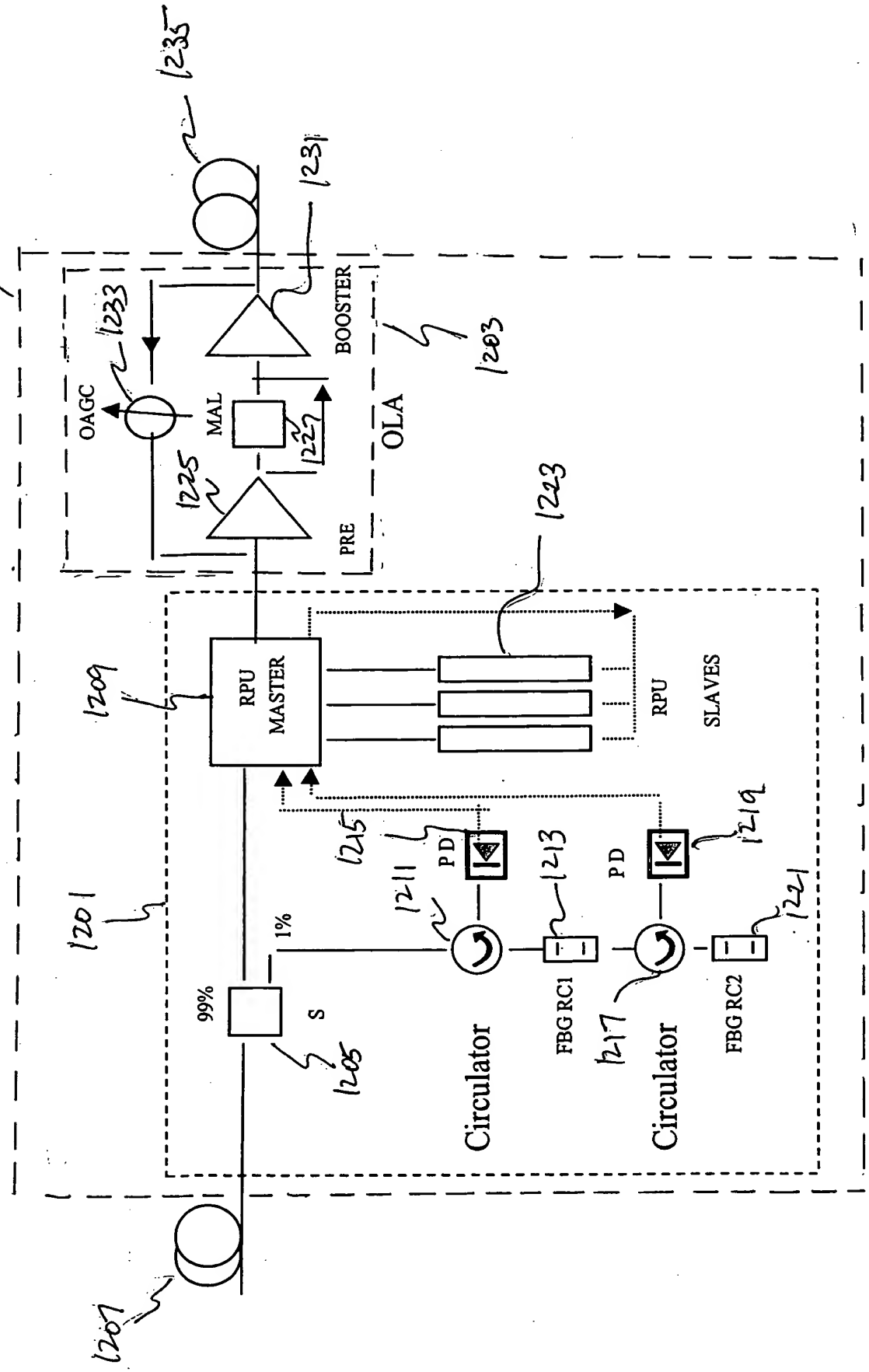

1200
1235
1231
1233
OAGC
BOOSTER
1203
MAL
1227
OLA
1225
PRE
1223
1209
RPU MASTER
RPU SLAVES
1201
1215
PD
1211
1213
PD
1219
1%
99%
S
1205
Circulator
FBG RC1
1217
Circulator
FBG RC2
1221
1207

FIG. 12

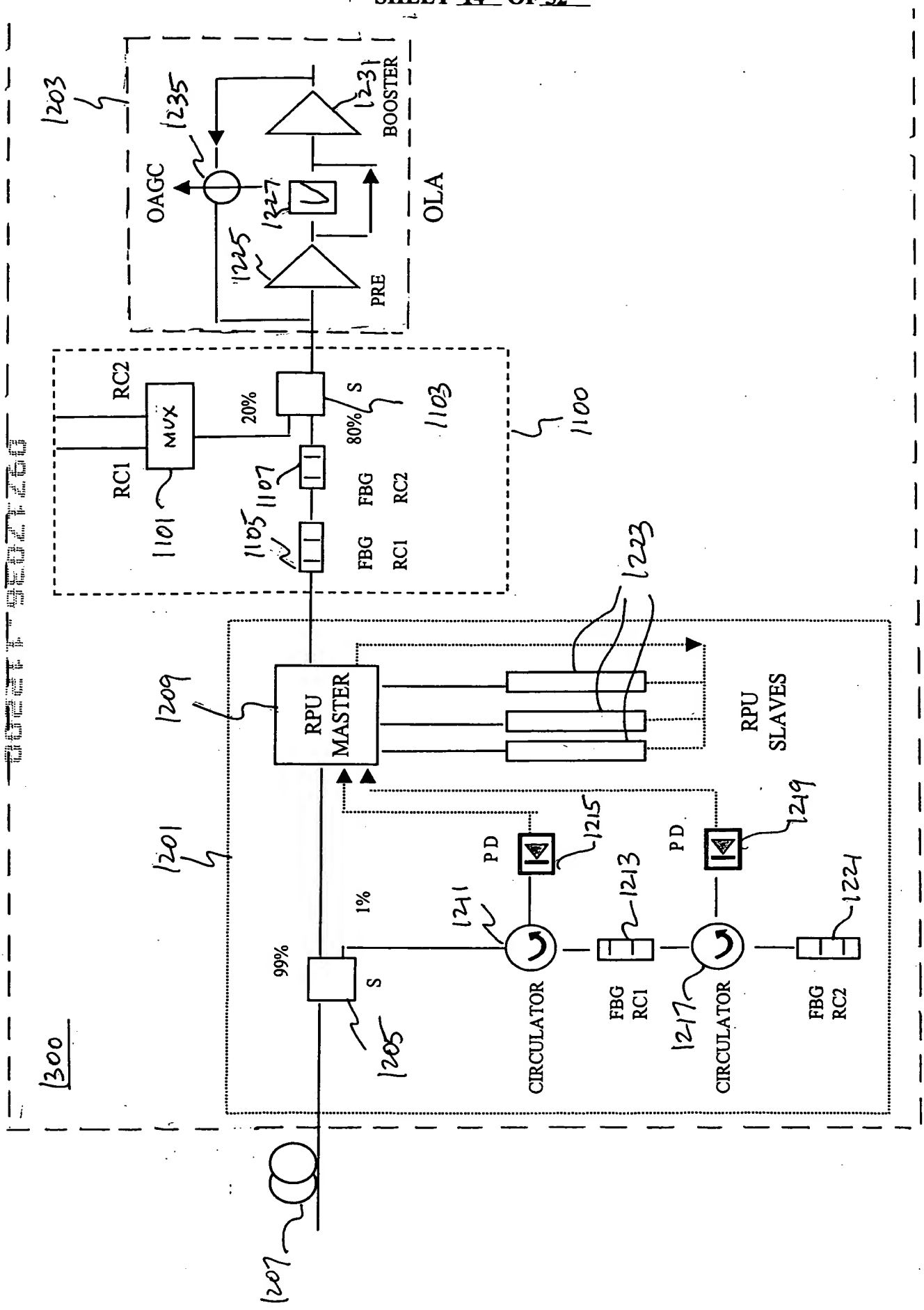

1203
1235
OAGC
1231
BOOSTER
1227
1225
PRE
OLA
RC2
MUX
RC1
1101
20%
80%
S
1103
1100
1107
1105
FBG
RC2
FBG
RC1
1223
1209
RPU
MASTER
RPU
SLAVES
1201
PD
1215
PD
1249
1%
99%
1241
1213
1224
S
1205
CIRCULATOR
FBG
RC1
1217
CIRCULATOR
FBG
RC2
1300
1207

FIG. 13

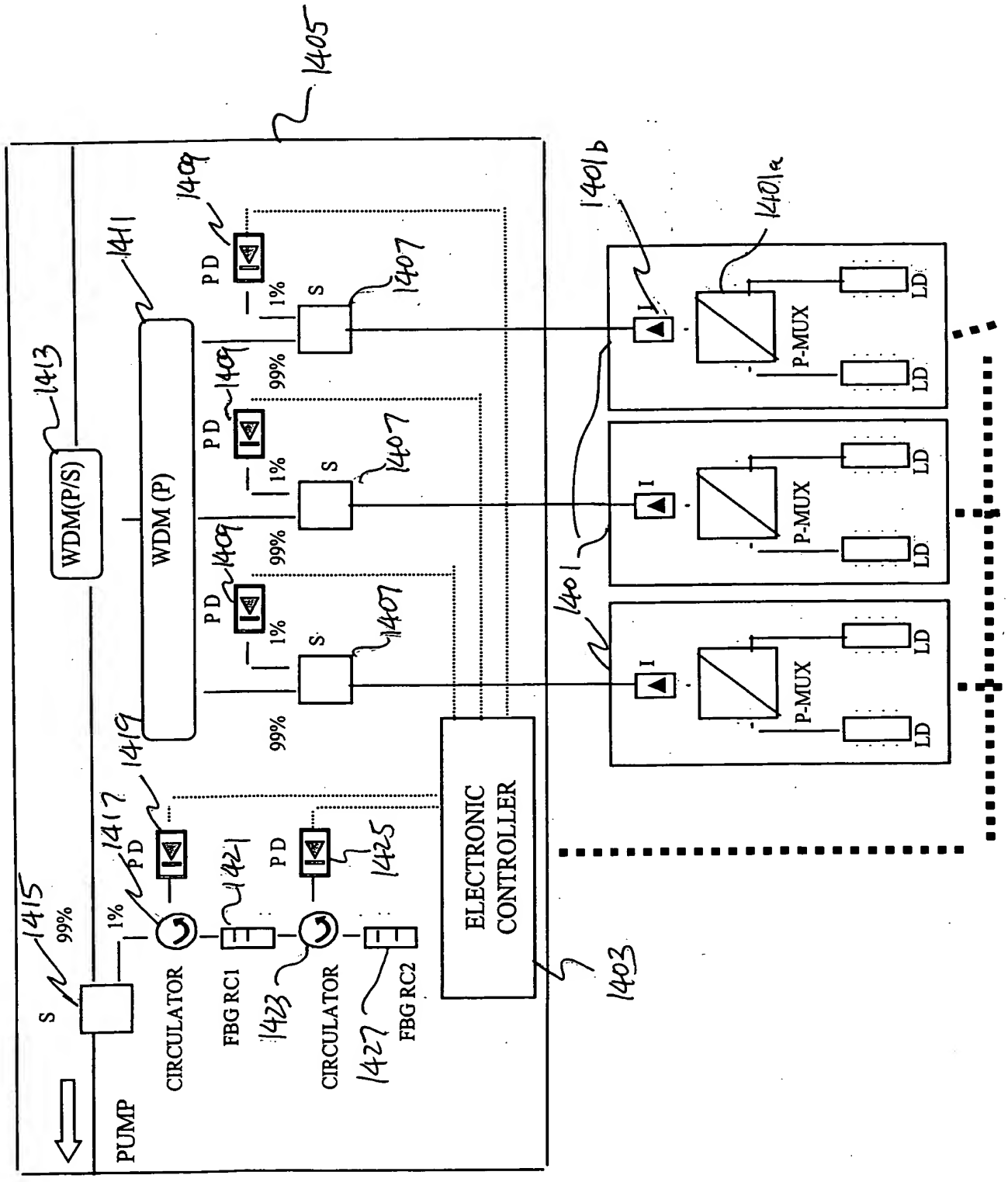

1405
1409
PD
1%
99%
1407
S
1411
WDM (P)
1413
WDM(P/S)
1401b
1401a
1401
P-MUX
LD
I
1419
1417
1415
1421
1425
1423
1427
FBG RC1
FBG RC2
CIRCULATOR
PUMP
ELECTRONIC CONTROLLER
1403
1400

FIG. 14

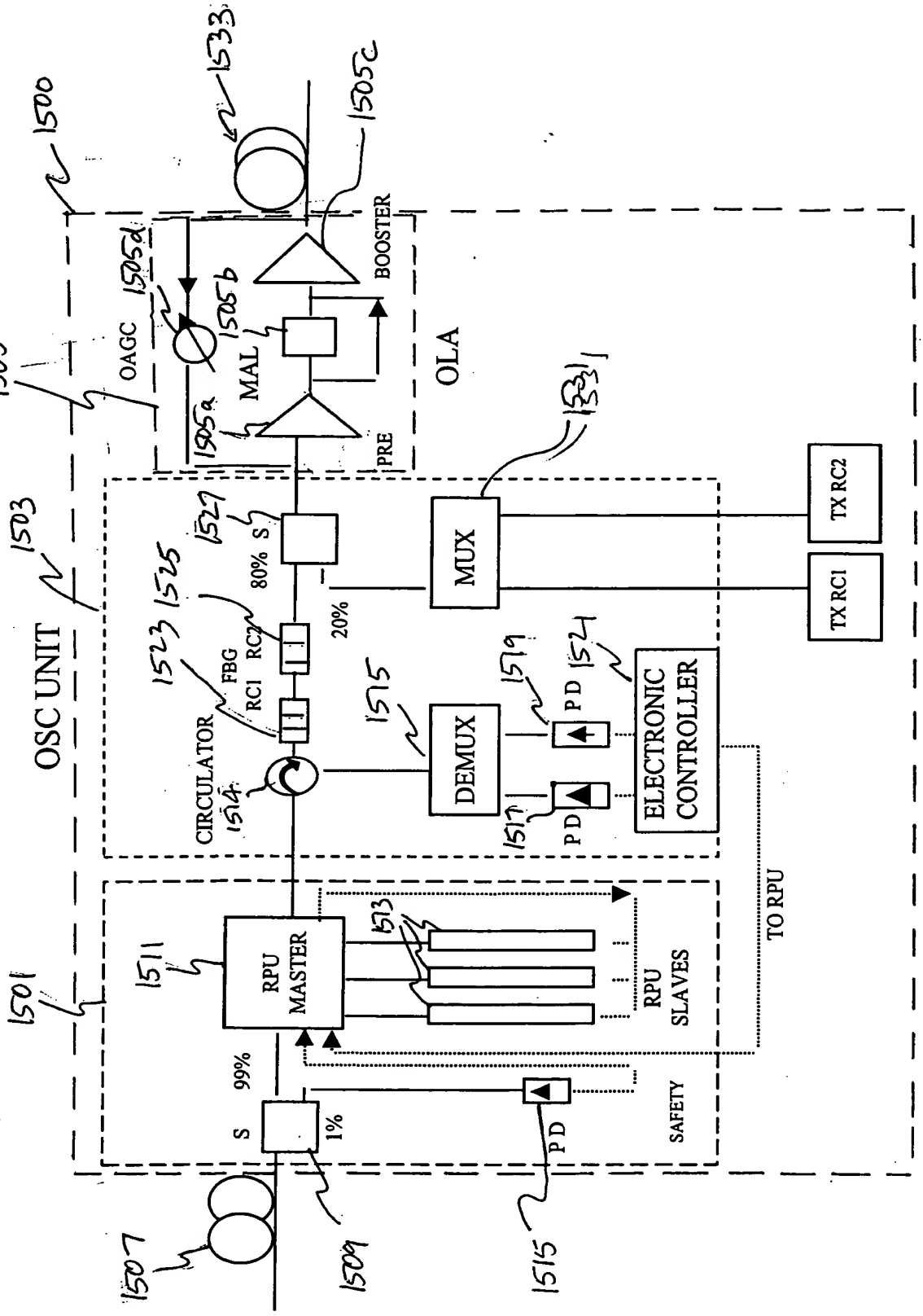

1500
1533
1505c
BOOSTER
1505d
1505b
OAGC
MAL
1505a
PRE
1505
OLA
1531
1503
OSC UNIT
1527
80% S
1525
20%
MUX
TX RC2
TX RC1
1523
FBG
RC2
RC1
CIRCULATOR
1514
1575
DEMUX
1519
PD
1524
ELECTRONIC CONTROLLER
1517
PD
TO RPU
1501
1511
RPU MASTER
1513
RPU SLAVES
99%
S
1%
SAFETY
PD
1507
1509
1515

FIG. 15

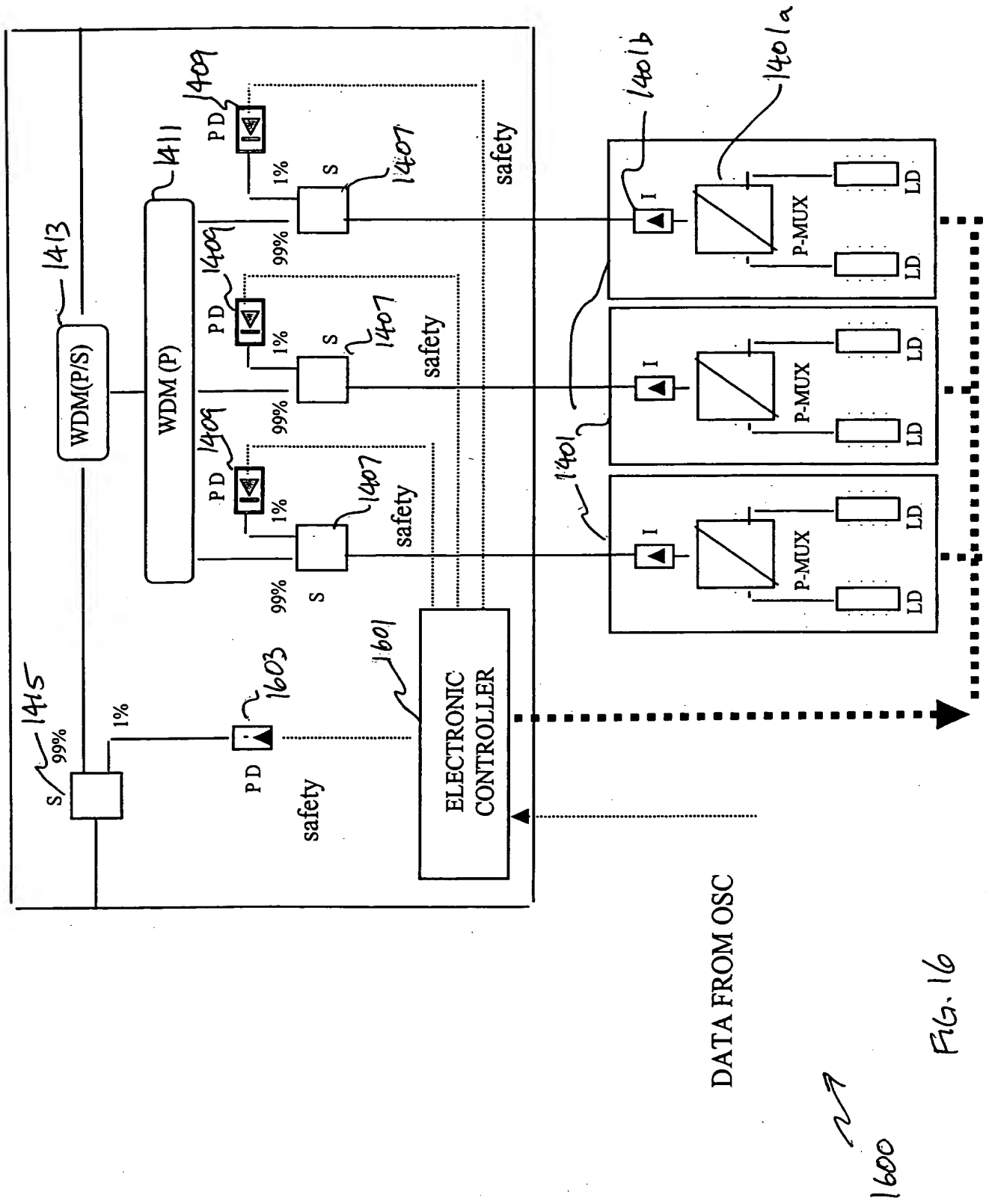

1600
1413
WDM(P/S)
WDM (P)
1411
1409
PD
1%
99%
S
1407
safety
1401
1401a
1401b
I
P-MUX
LD
1445
1603
1601
ELECTRONIC CONTROLLER
DATA FROM OSC

FIG. 16

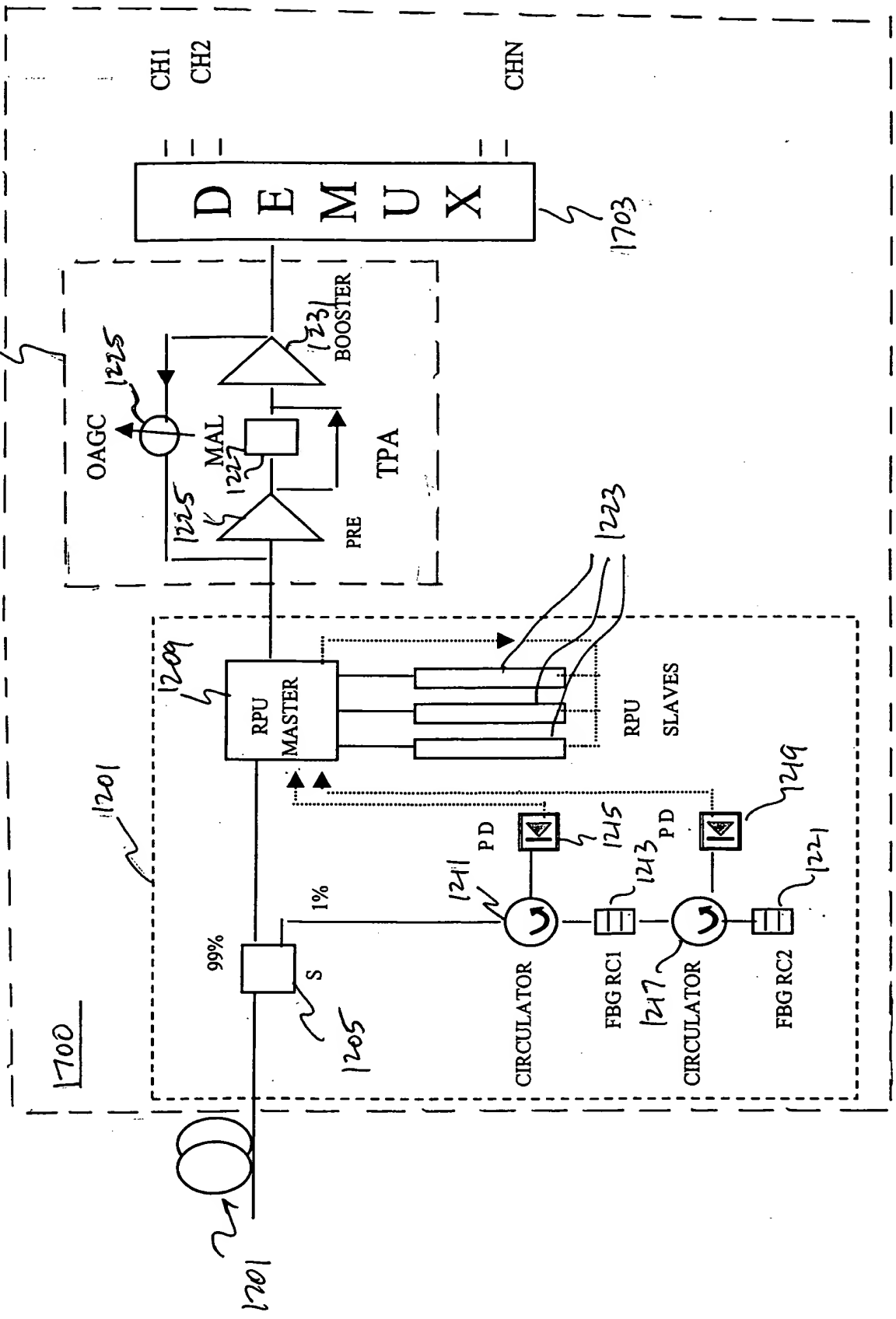

CH1
CH2
CHN
DEMUX
1703
1203
OAGC
1225
MAL
1227
1215
PRE
TPA
BOOSTER
1231
1223
1209
RPU MASTER
RPU SLAVES
1201
1249
PD
1245
1241
1243
1%
99%
S
1205
CIRCULATOR
FBG RC1
1247
CIRCULATOR
FBG RC2
1221
1700
1701

FIG. 17

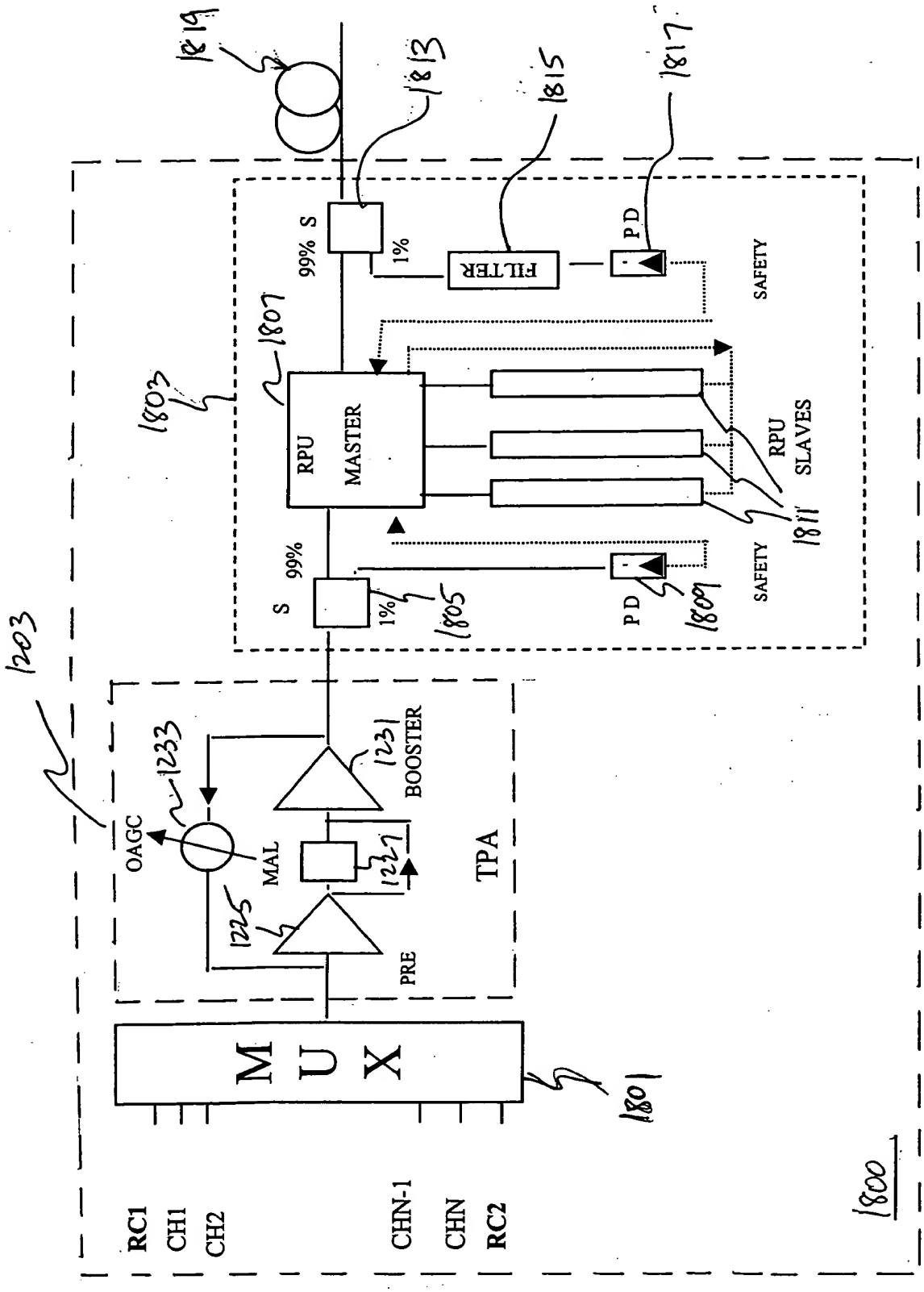

1819
1813
1815
1817
99% S
1%
FILTER
PD
SAFETY
1807
1803
RPU MASTER
RPU SLAVES
1811
S 99%
1%
1805
PD
1809
SAFETY
1203
1233
1231
BOOSTER
OAGC
MAL
1227
1225
TPA
PRE
M U X
1801
RC1
CH1
CH2
CHN-1
CHN
RC2
1800

FIG. 18

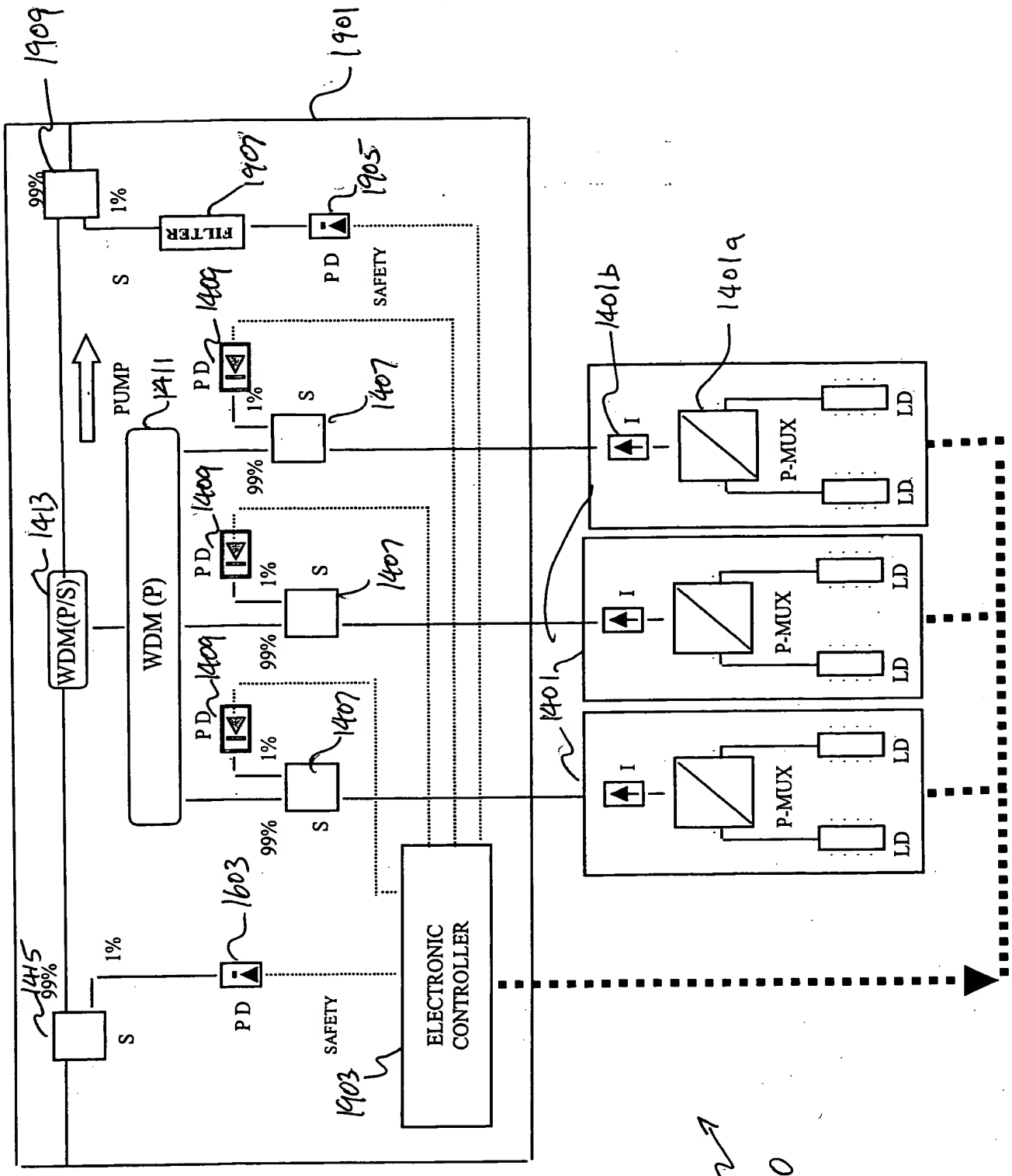

1909
1901
99%
1%
FILTER
1907
1905
PD
SAFETY
S
1409
PD
1%
1411
PUMP
1407
99%
1413
WDM(P/S)
WDM (P)
1401a
1401b
I
P-MUX
LD
1401
1603
1445
ELECTRONIC CONTROLLER
1903
1900

FIG. 19

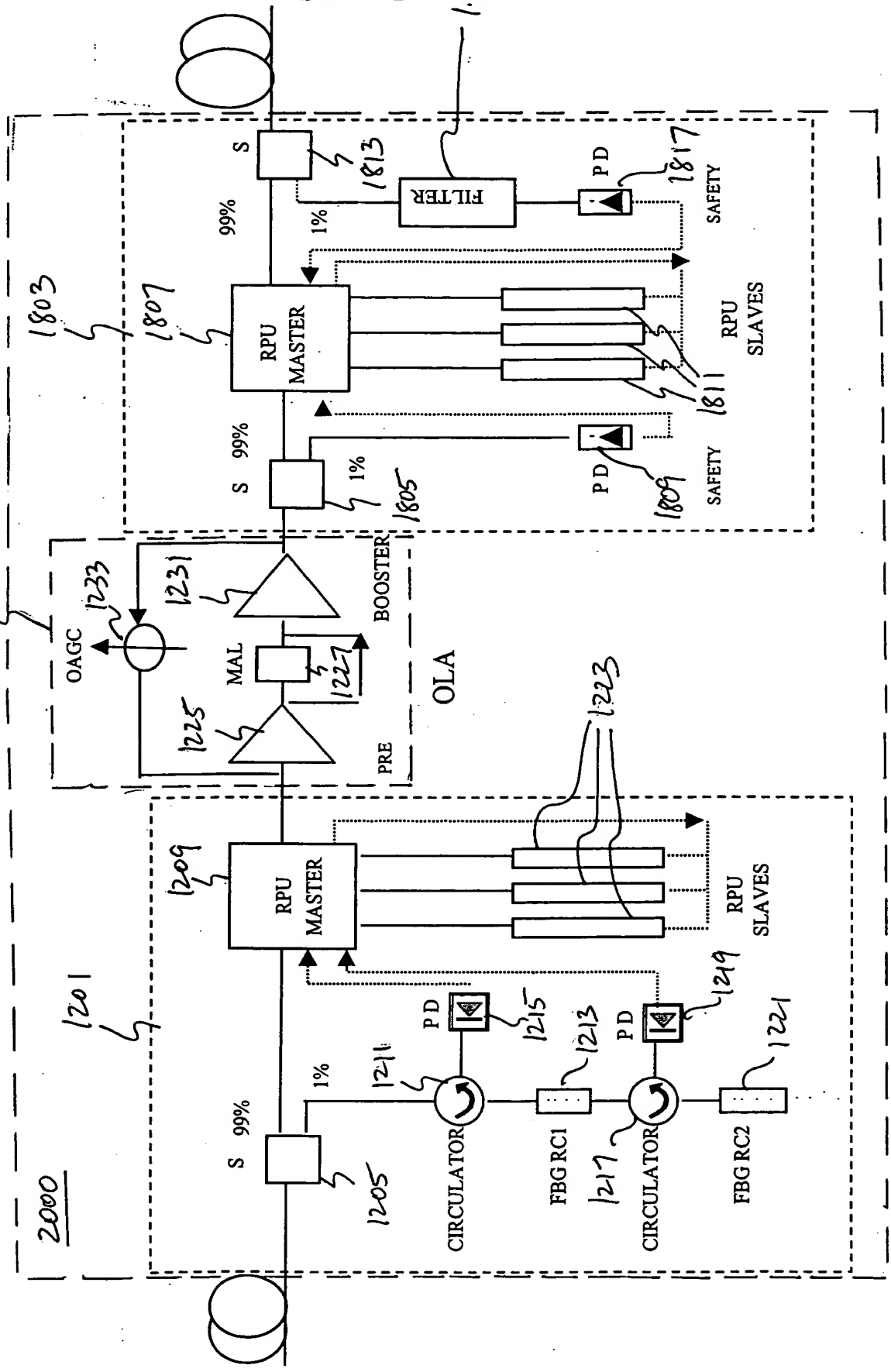

2000
1201
1203
1205
1207
1209
1211
1213
1215
1217
1219
1221
1223
1225
1227
1231
1233
1803
1805
1807
1809
1811
1813
1817
S
99%
1%
PD
SAFETY
FILTER
RPU MASTER
RPU SLAVES
OLA
BOOSTER
PRE
MAL
OAGC
CIRCULATOR
FBG RC1
FBG RC2

FIG. 20

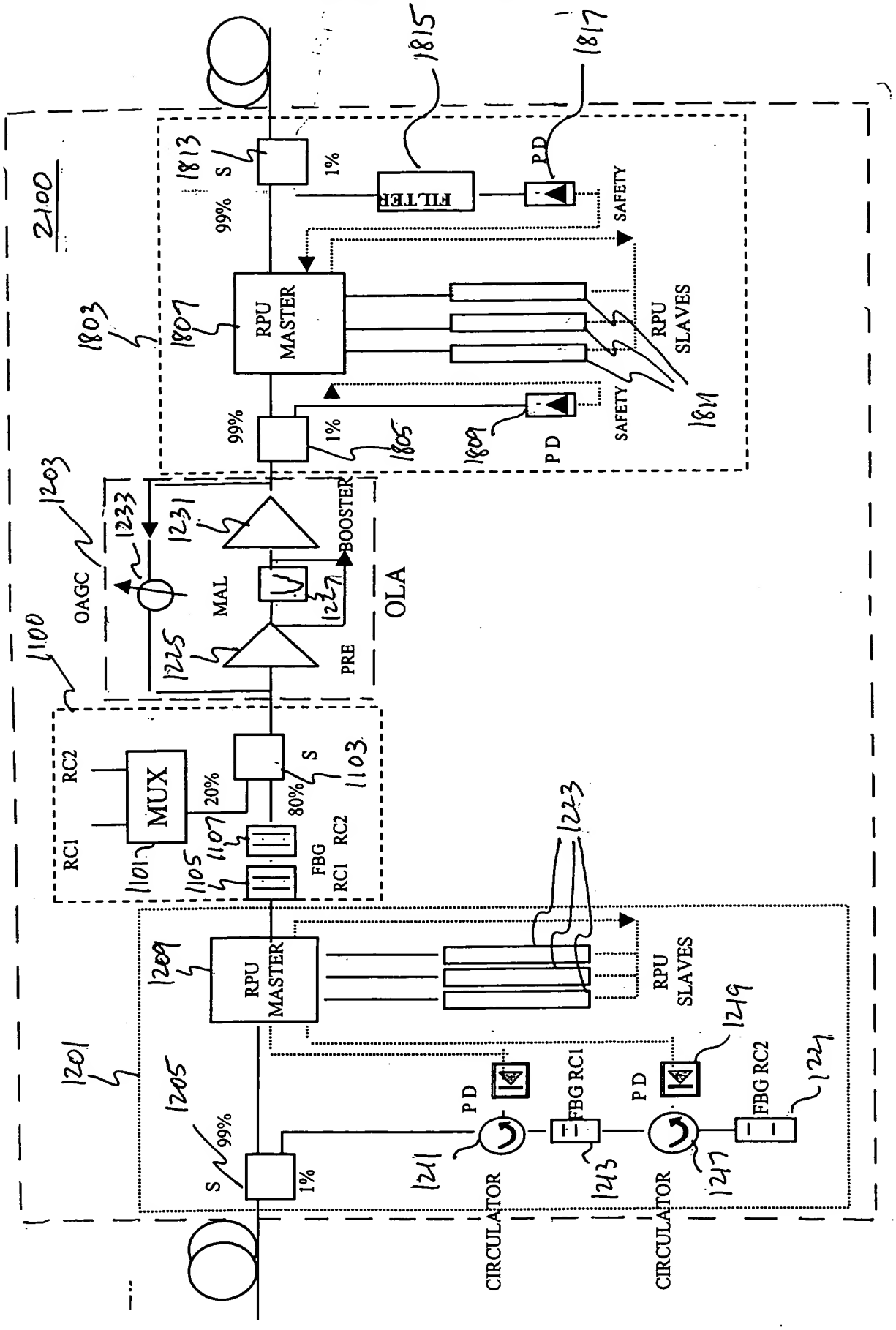

2100
1803
1807
RPU MASTER
1813
S
99%
1%
1815
FILTER
1817
PD
SAFETY
RPU SLAVES
1811
1809
1805
1203
1233
1231
BOOSTER
OAGC
MAL
1227
OLA
1225
PRE
1100
RC2
RC1
MUX
1101
20%
80%
1107
1105
FBG RC1 RC2
1103
1223
1209
1201
1205
1249
1241
1243
1247
1224
CIRCULATOR
CIRCULATOR

Fig. 21

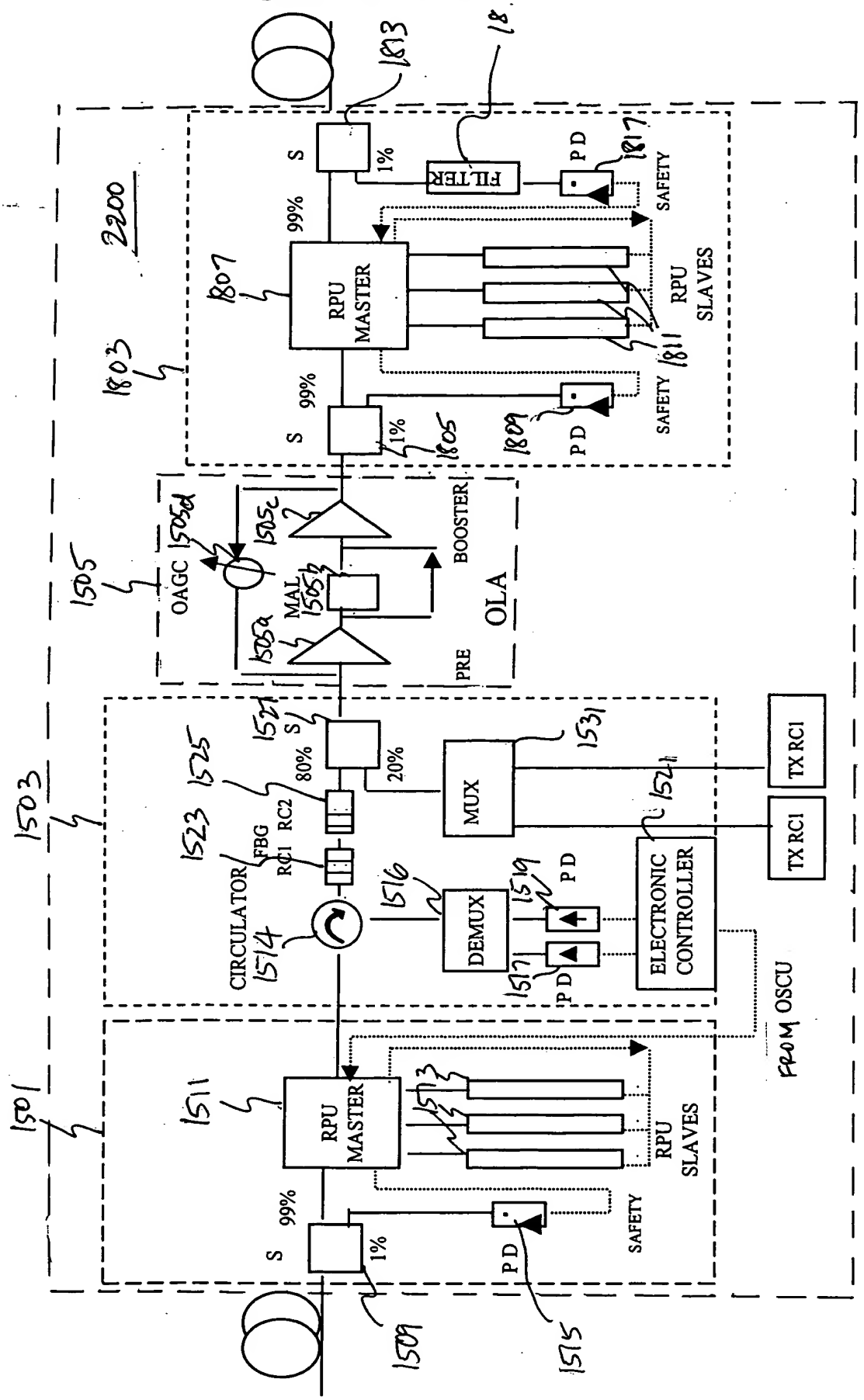

2200
1803
807
RPU MASTER
RPU SLAVES
99%
1%
S
FILTER
PD
SAFETY
1817
1811
1809
1805
1813
1505
OAGC
1505d
1505c
1505b
MAL
BOOSTER
PRE
OLA
1503
1525
1523
1527
80%
20%
MUX
1531
TX RC1
TX RC1
1521
FBG
RC1
RC2
CIRCULATOR
1514
1516
DEMUX
1519
1517
ELECTRONIC CONTROLLER
FROM OSCU
1501
1511
1513
1509
1515

FIG. 22

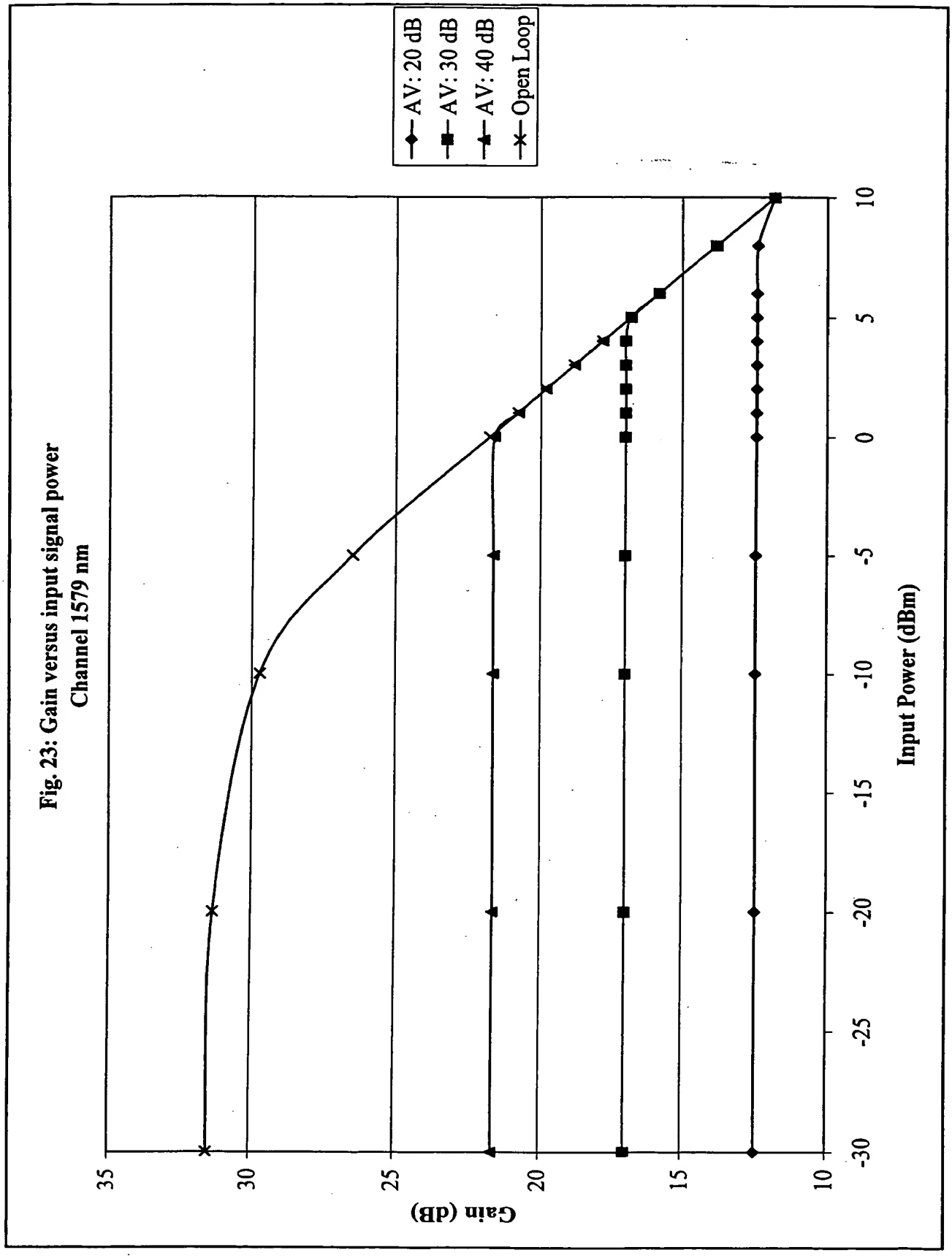


Fig. 23: Gain versus input signal power
Channel 1579 nm

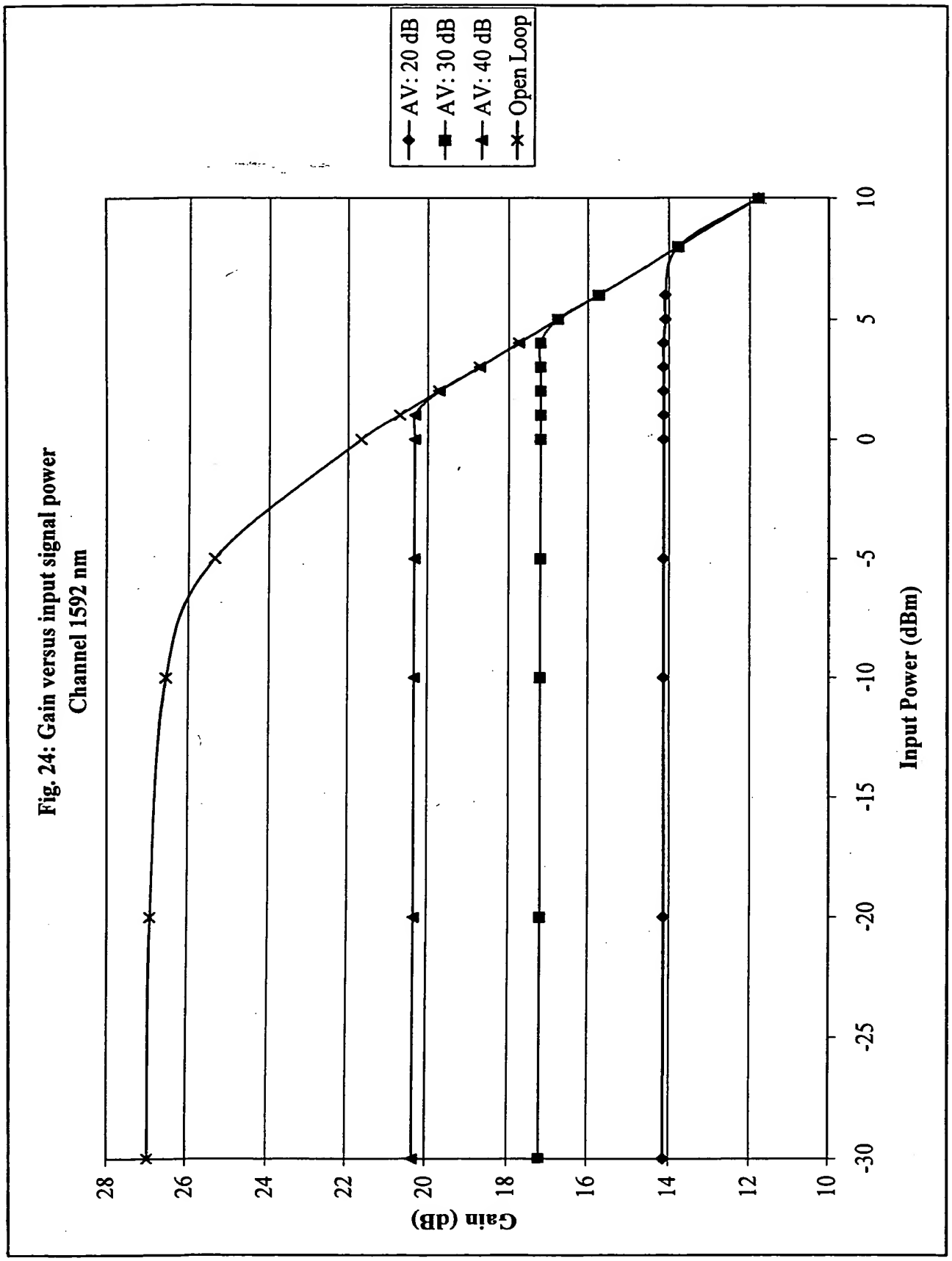


Fig. 24: Gain versus input signal power
Channel 1592 nm

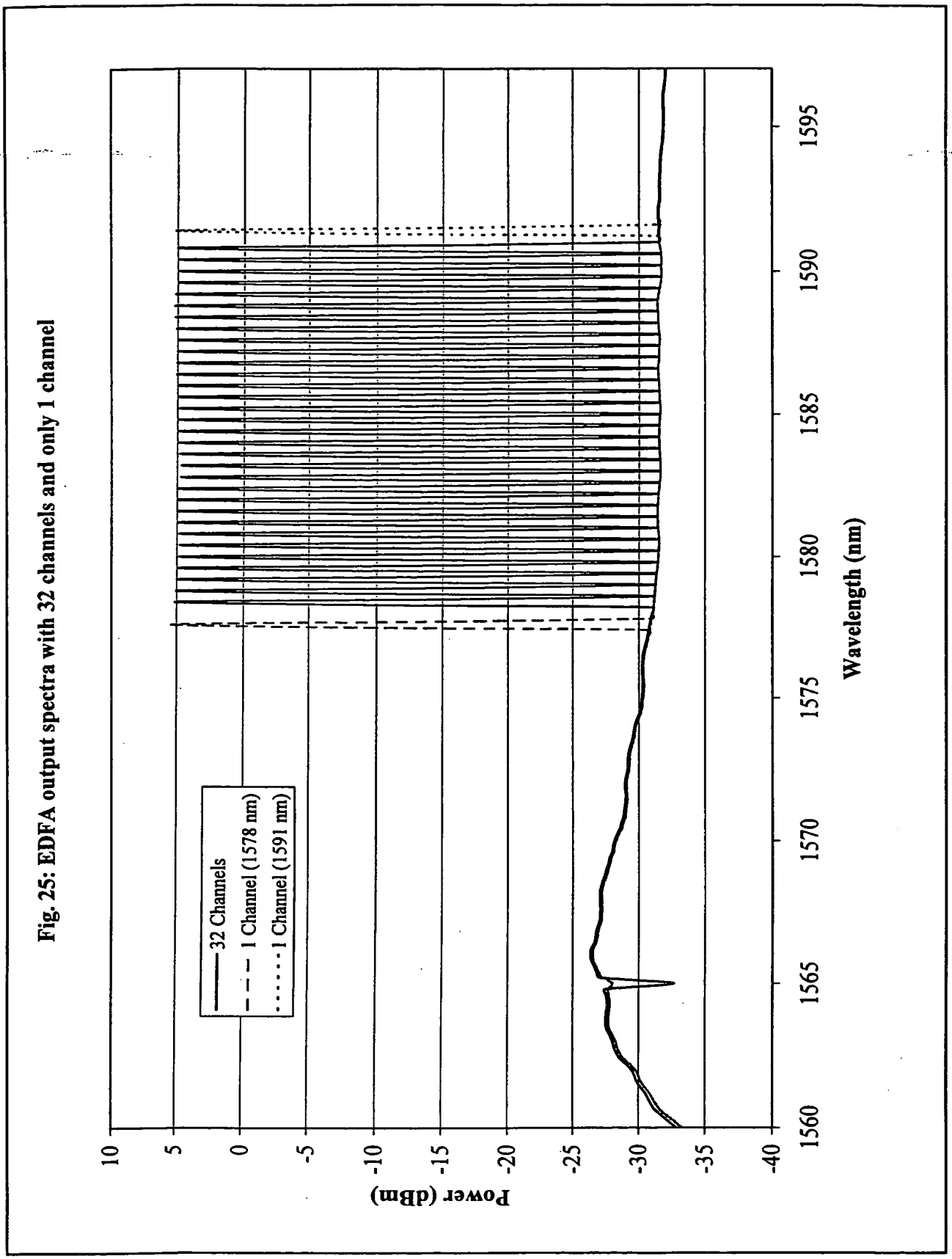


Fig. 25: EDFA output spectra with 32 channels and only 1 channel

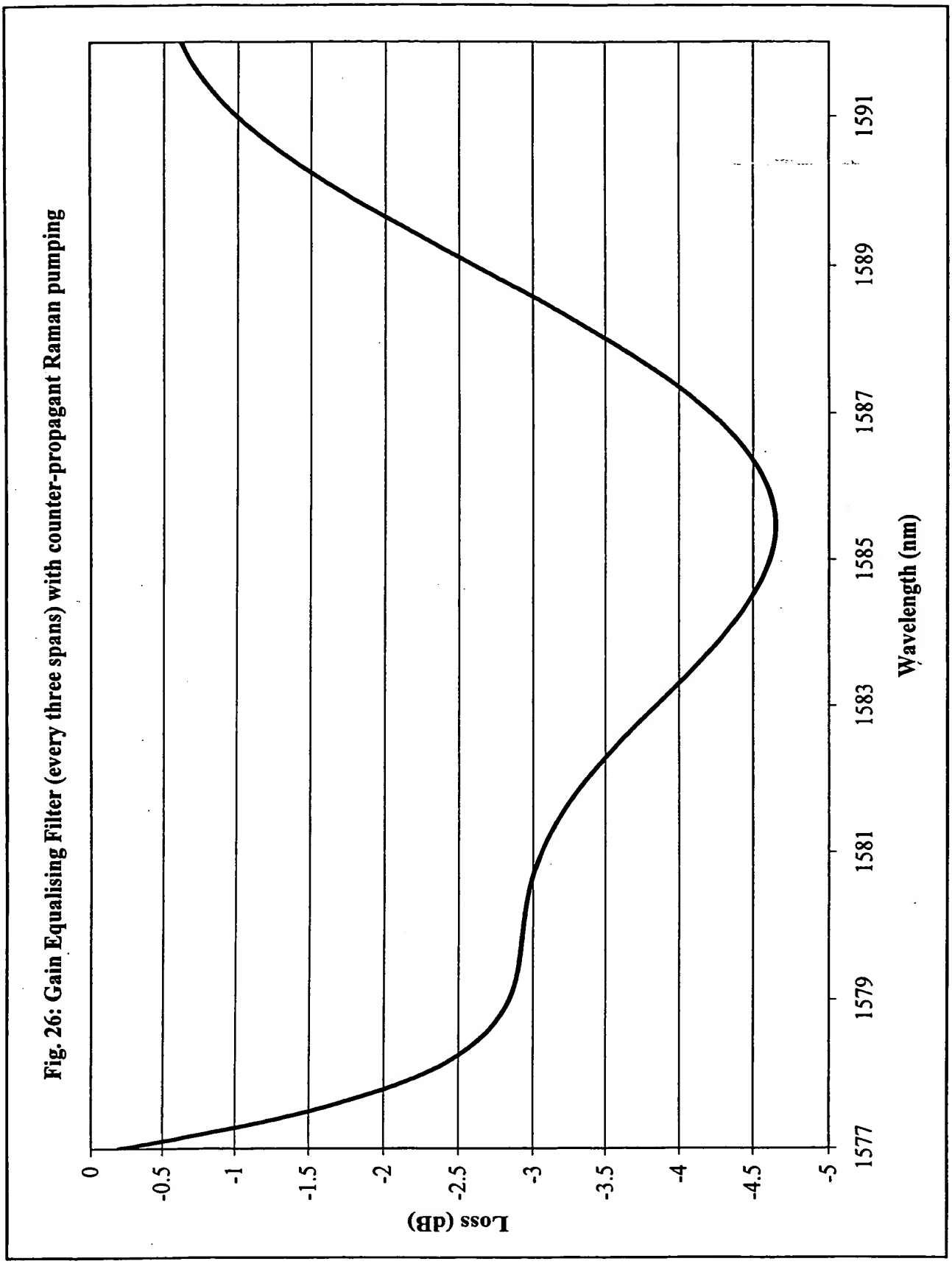


Fig. 26: Gain Equalising Filter (every three spans) with counter-propagant Raman pumping

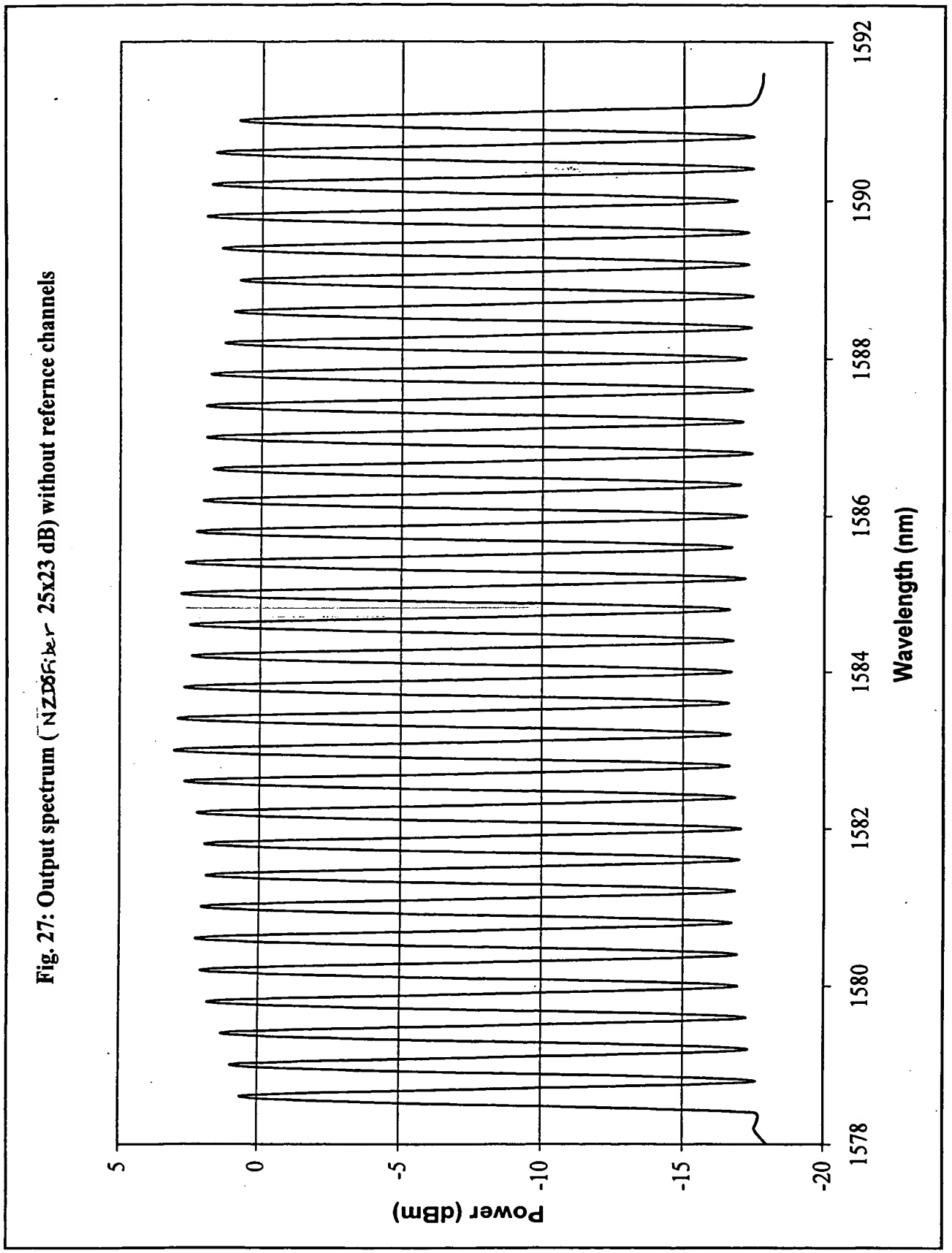


Fig. 27: Output spectrum (NZDSfiber 25x23 dB) without refernce channels

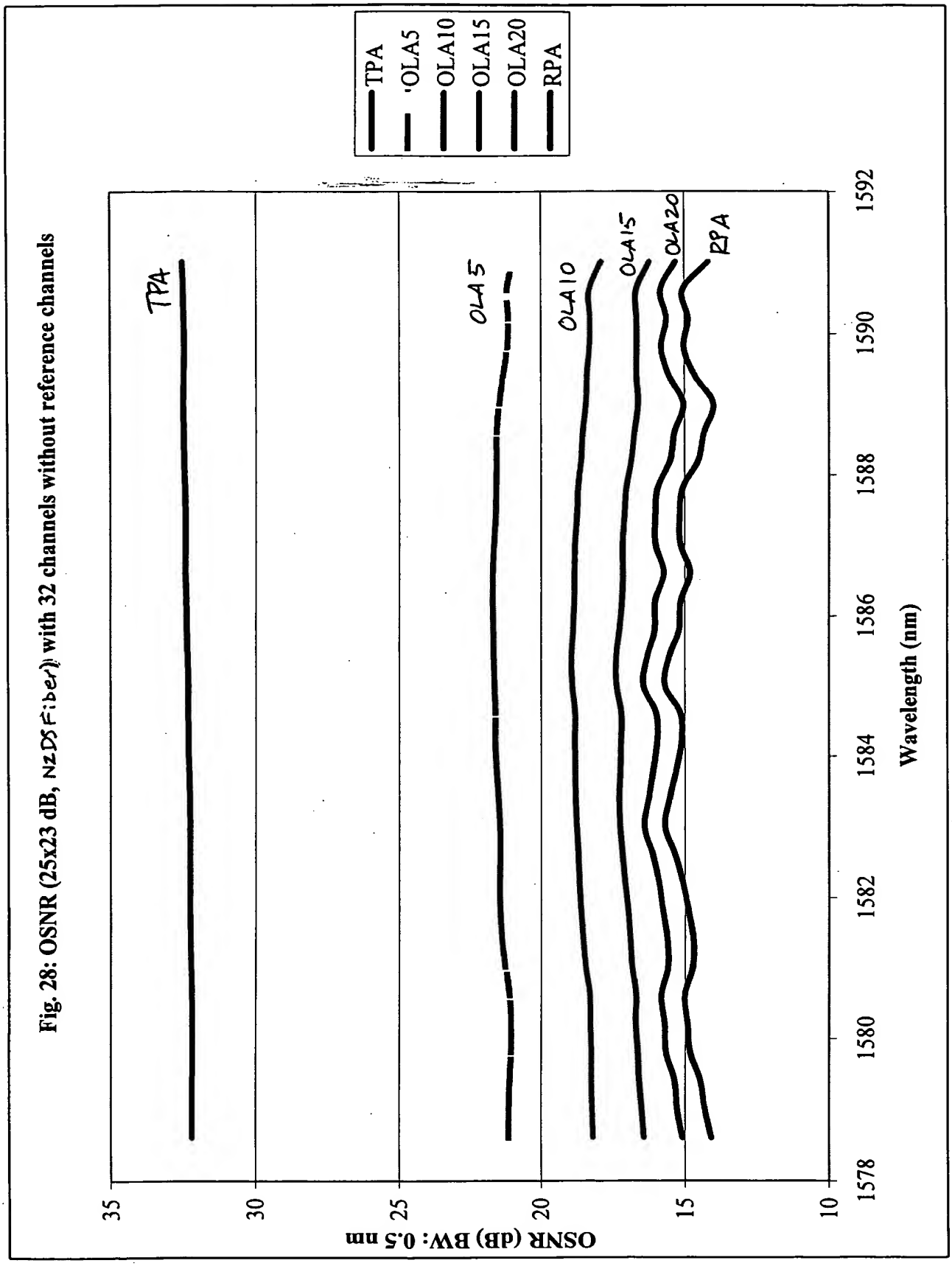


Fig. 28: OSNR (25x23 dB, NZDSFiber) with 32 channels without reference channels

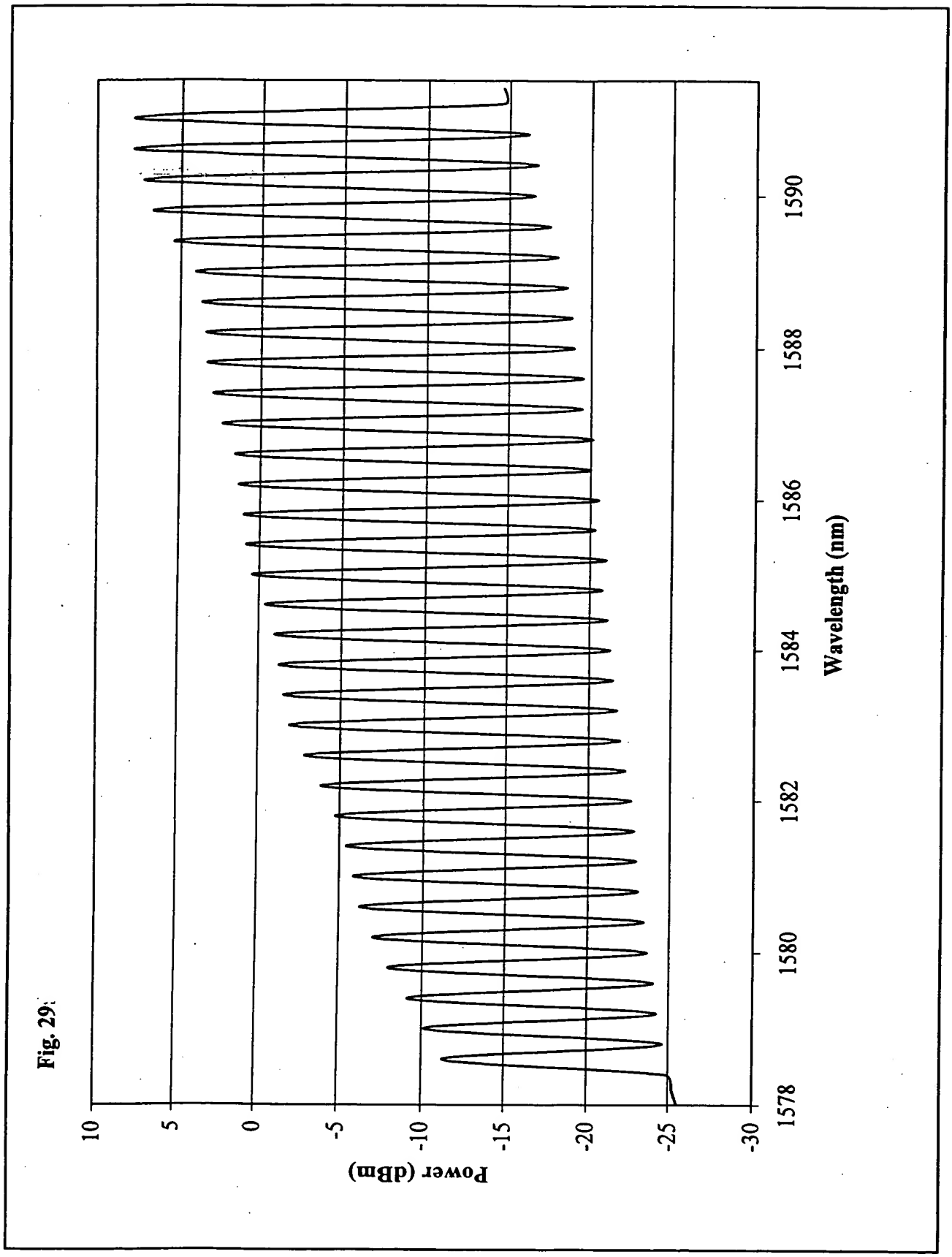

Power (dBm)
10
5
0
-5
-10
-15
-20
-25
-30
1578
1580
1582
1584
1586
1588
1590
Wavelength (nm)

Fig. 29

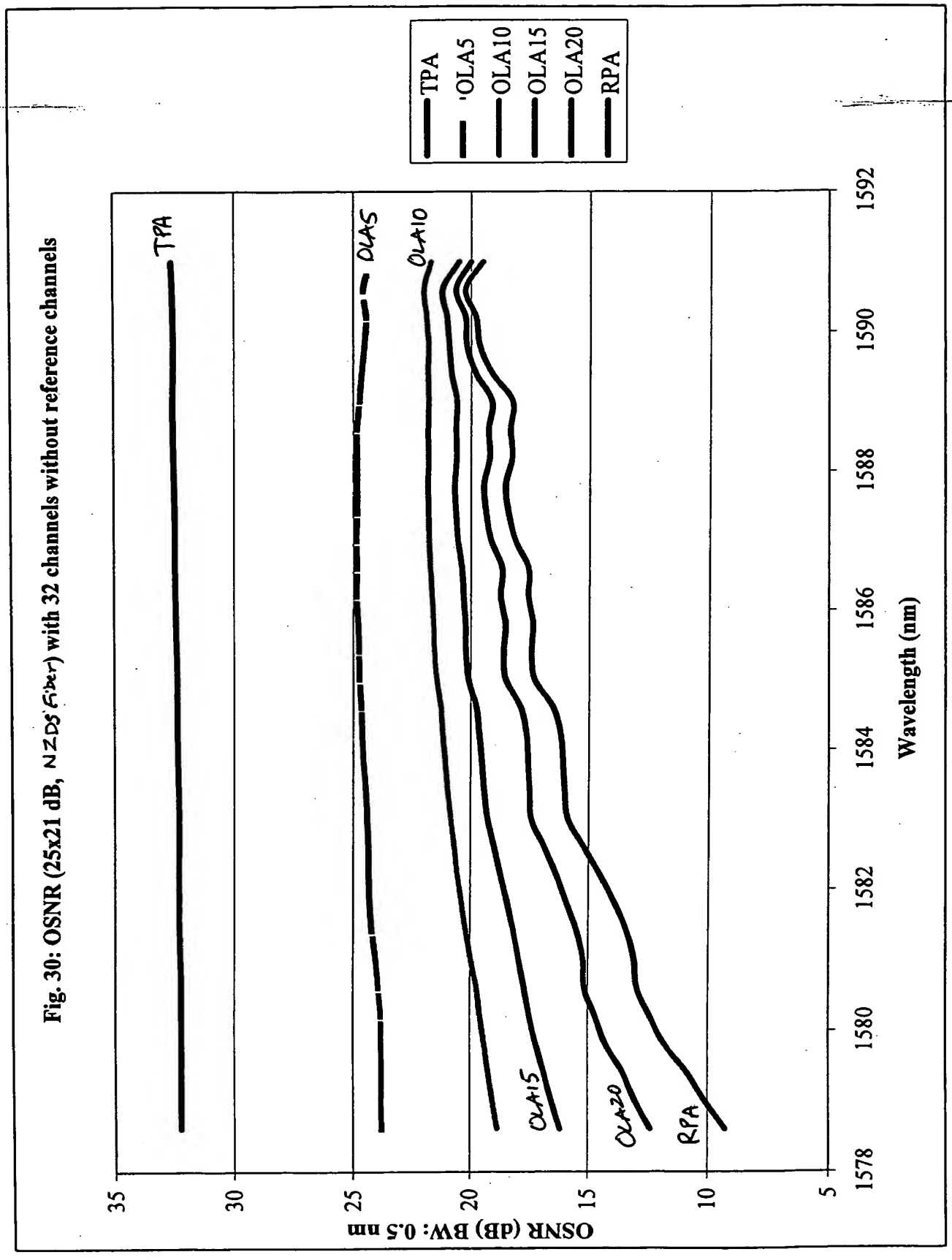


Fig. 30: OSNR (25x21 dB, NZDS fiber) with 32 channels without reference channels

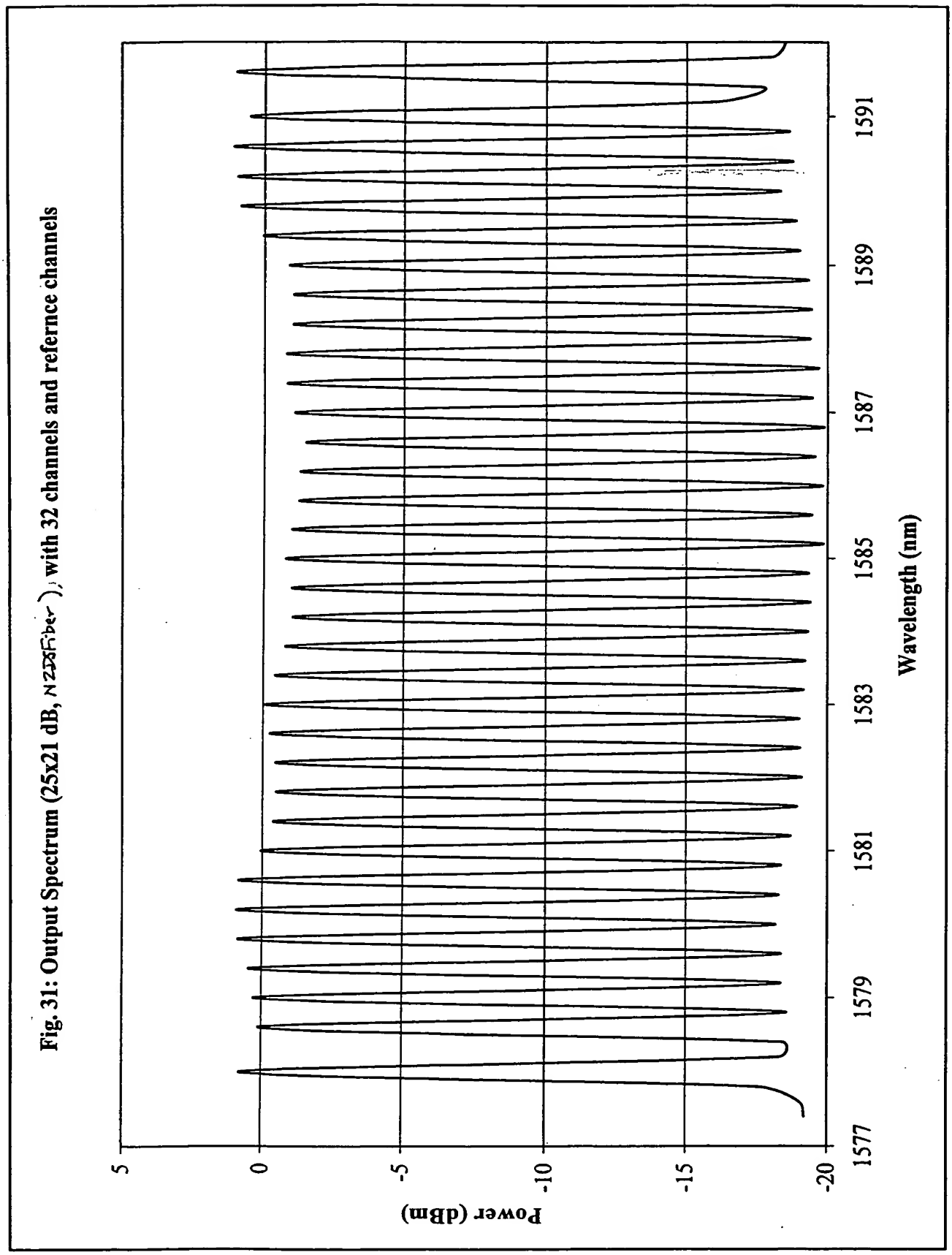


Fig. 31: Output Spectrum (25x21 dB, NZDSFiber), with 32 channels and refernce channels

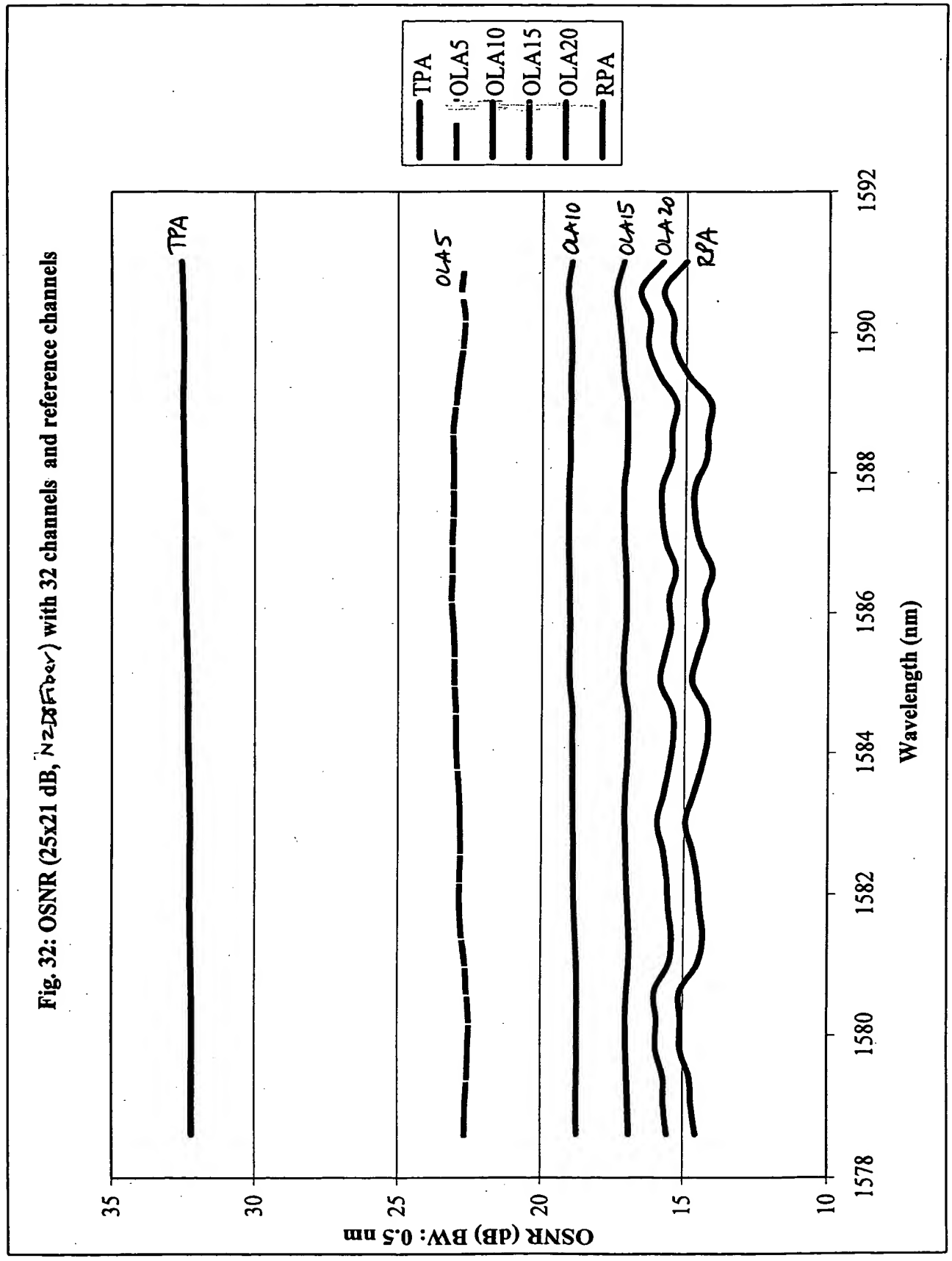


Fig. 32: OSNR (25x21 dB, NZDSF/PLEV) with 32 channels and reference channels

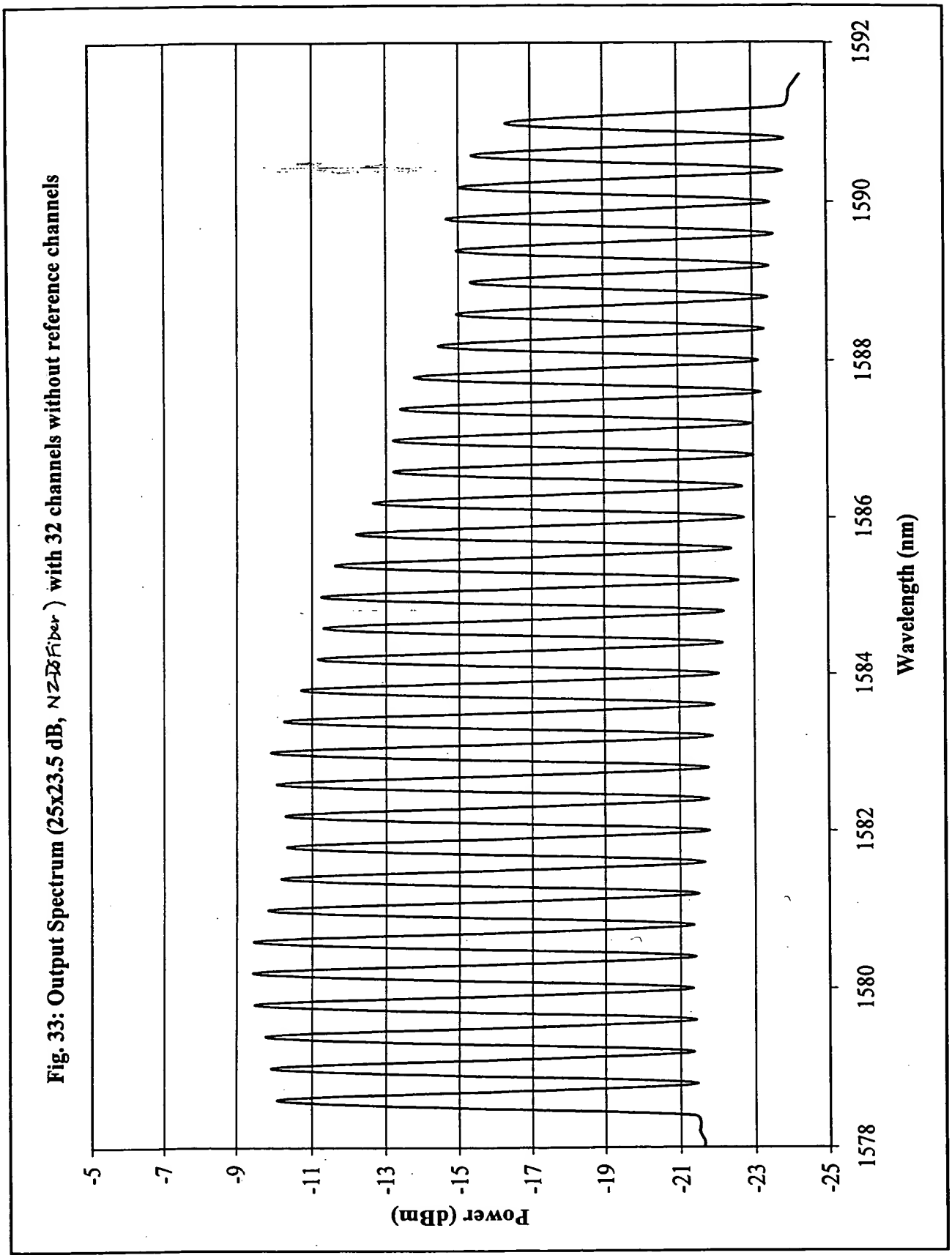


Fig. 33: Output Spectrum (25x23.5 dB, NZDFiber) with 32 channels without reference channels

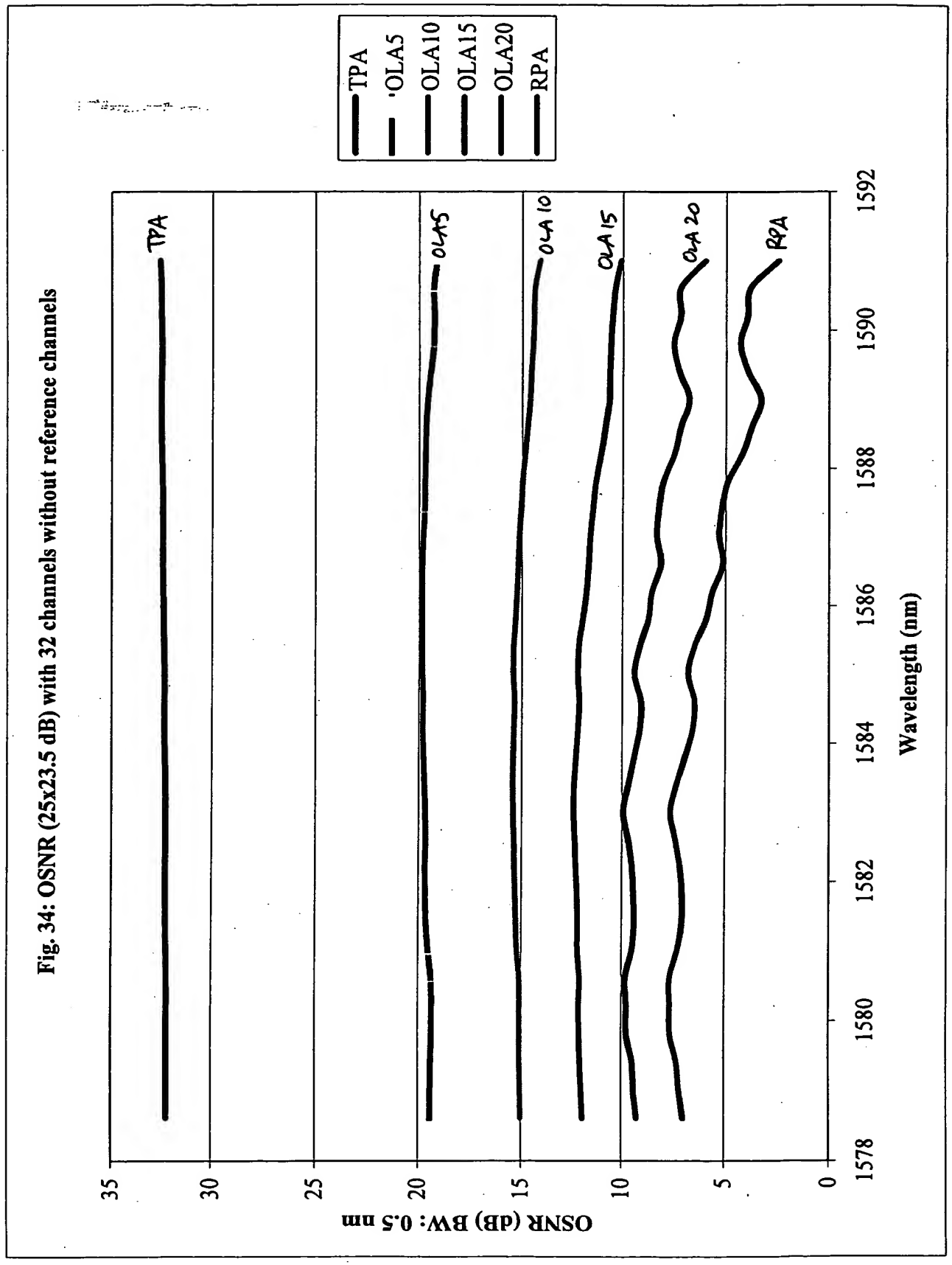


Fig. 34: OSNR (25x23.5 dB) with 32 channels without reference channels

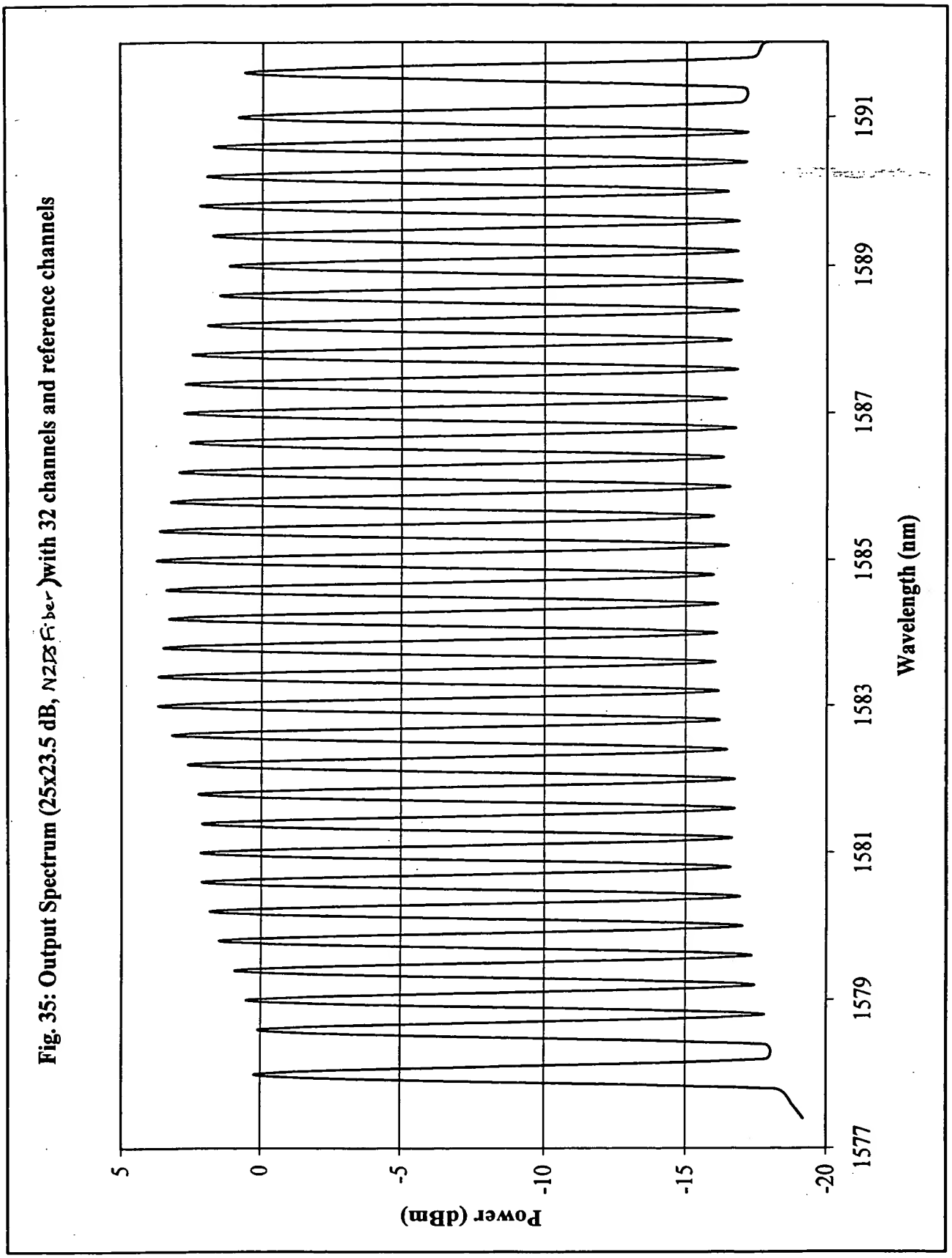


Fig. 35: Output Spectrum (25x23.5 dB, NZDSFiber) with 32 channels and reference channels

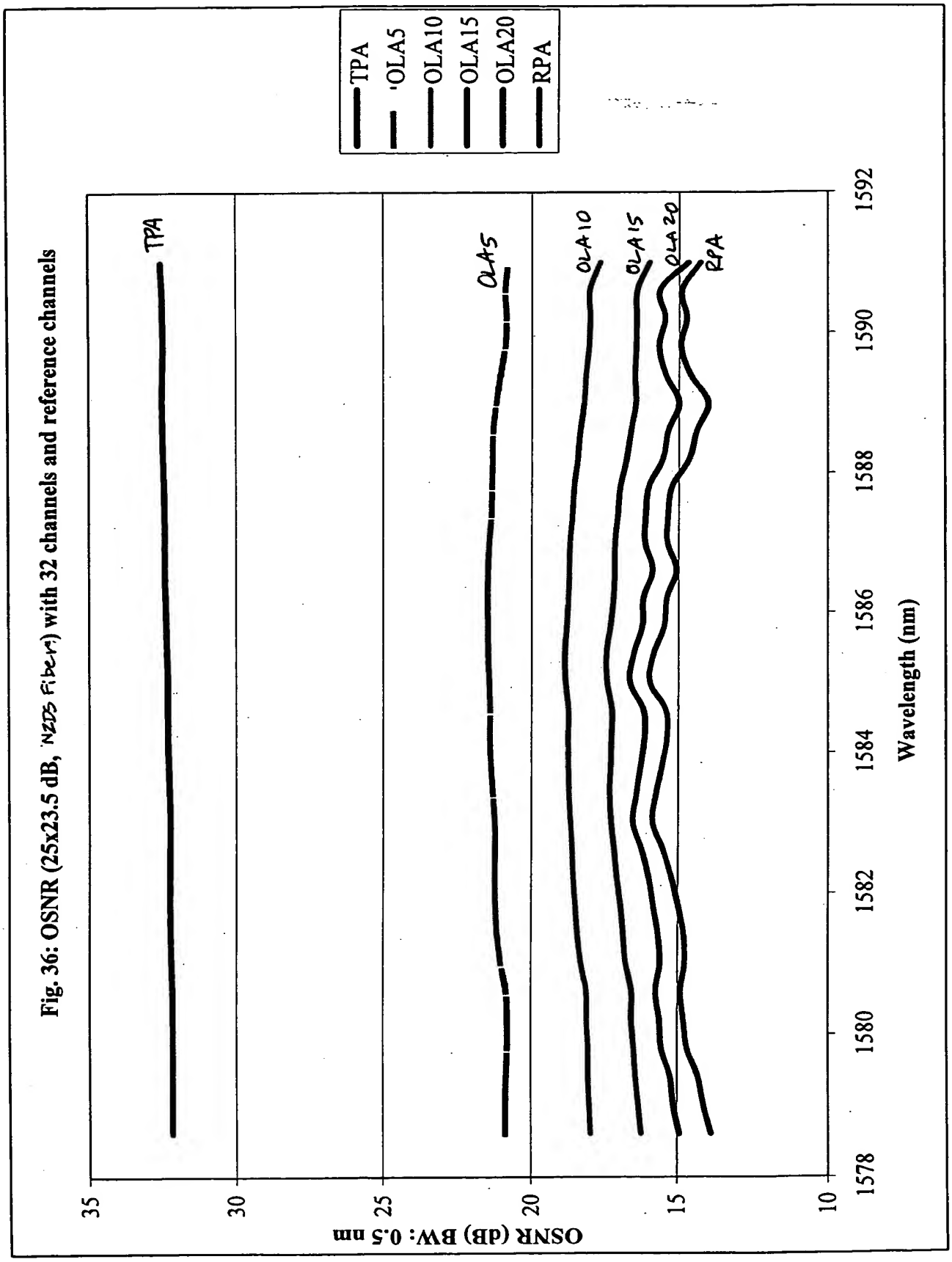


Fig. 36: OSNR (25x23.5 dB, NZDS fiber) with 32 channels and reference channels

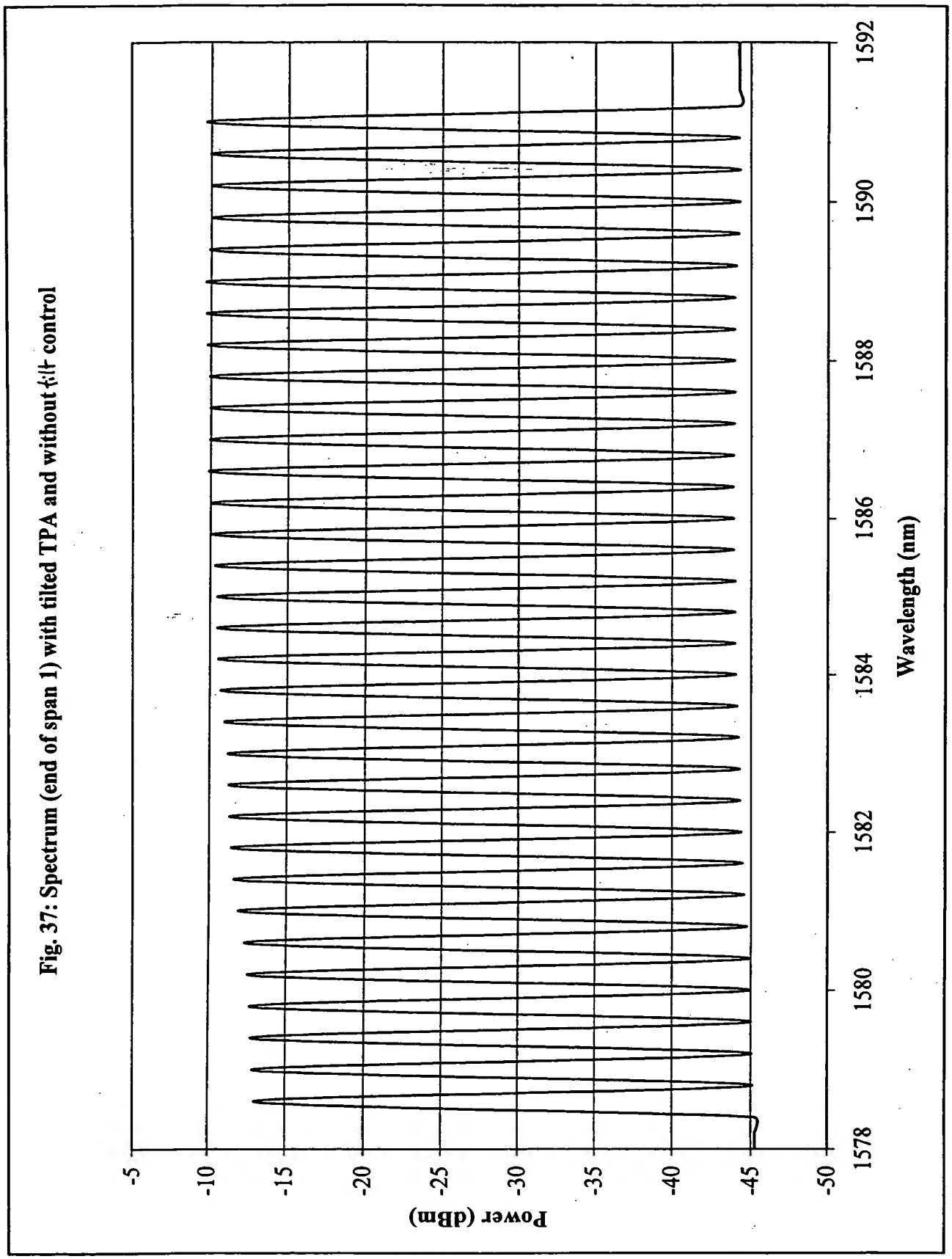


Fig. 37: Spectrum (end of span 1) with tilted TPA and without tilt control

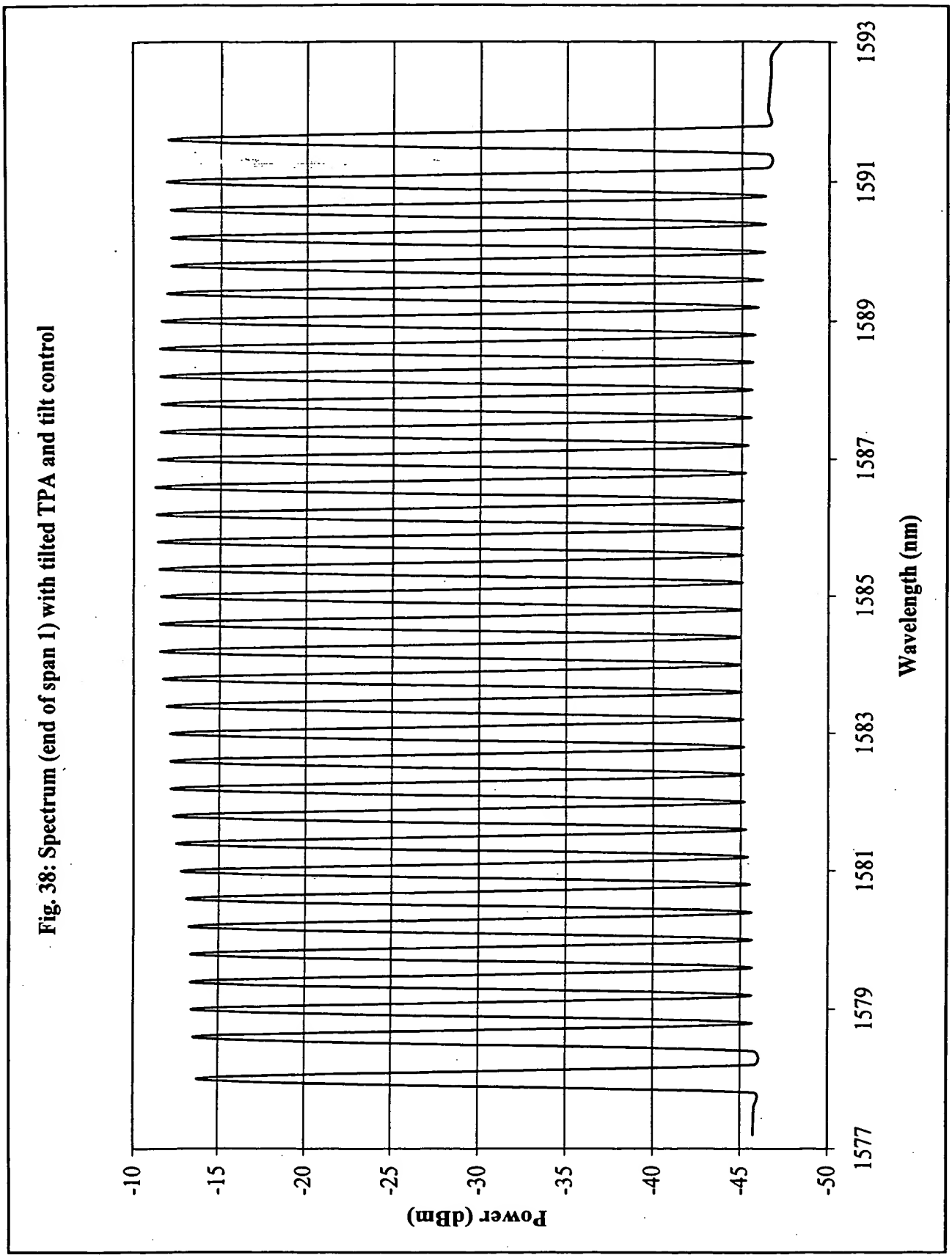


Fig. 38: Spectrum (end of span 1) with tilted TPA and tilt control

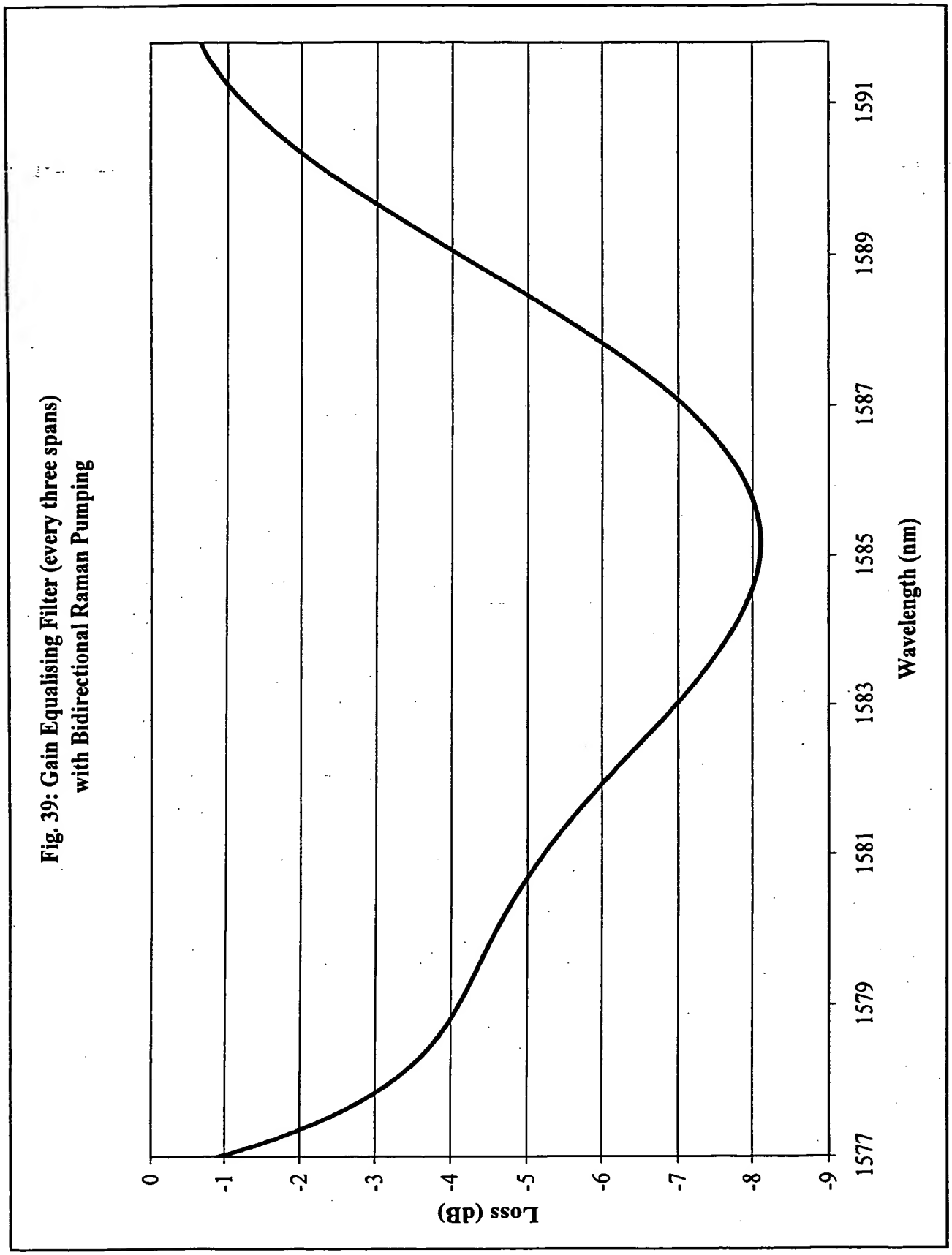


Fig. 39: Gain Equalising Filter (every three spans) with Bidirectional Raman Pumping

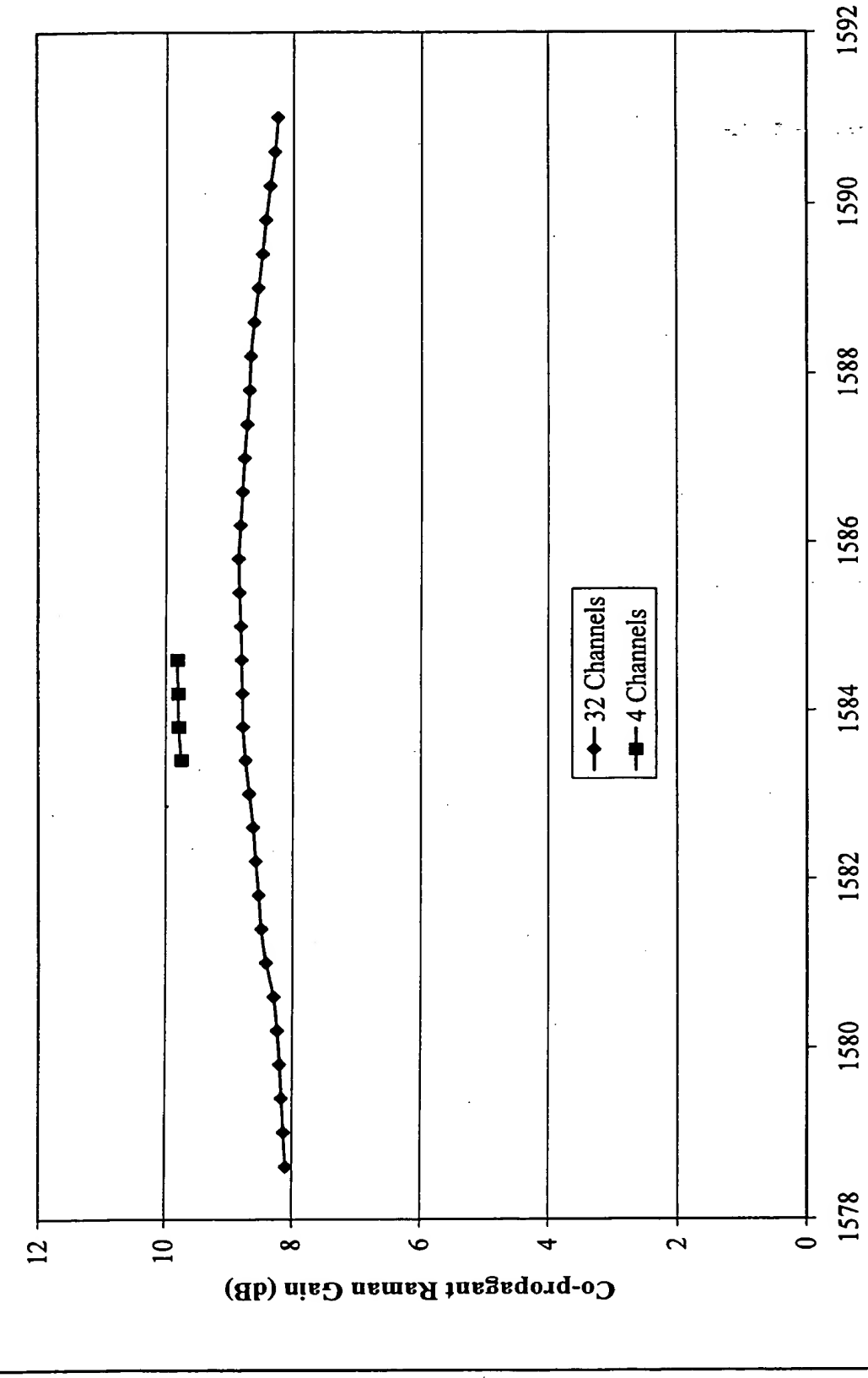


Fig. 40: Co-propagant Raman gain saturation

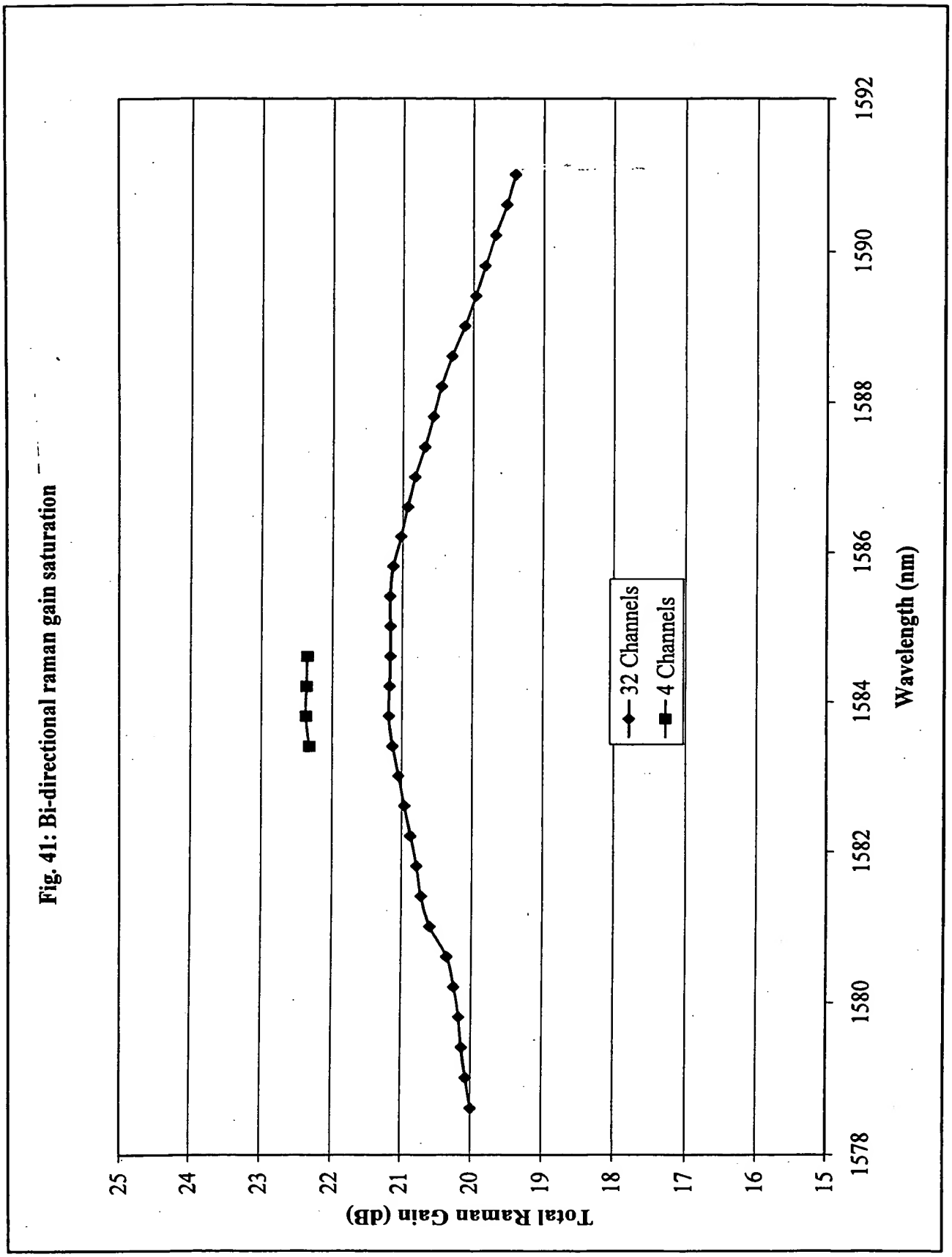


Fig. 41: Bi-directional raman gain saturation

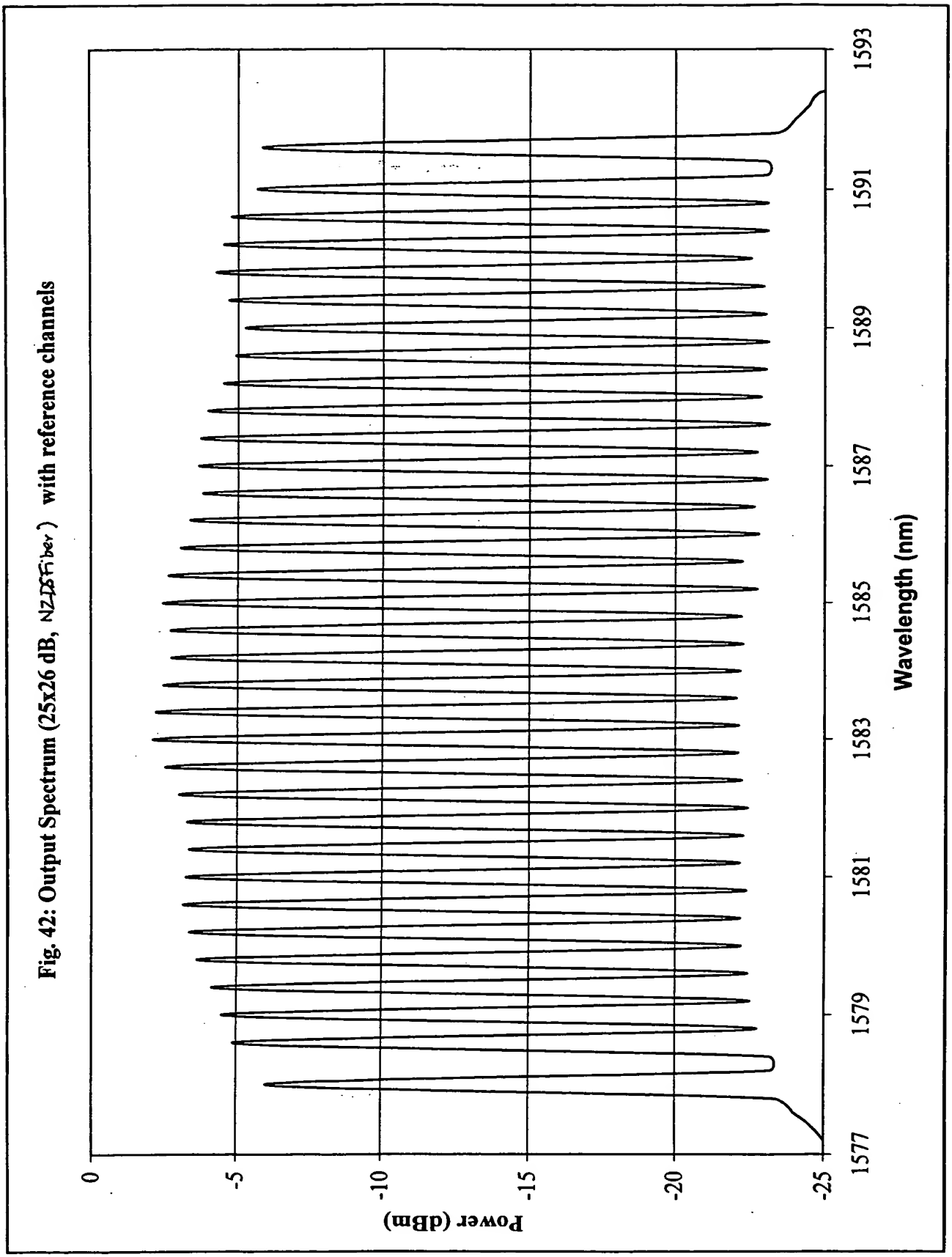


Fig. 42: Output Spectrum (25x26 dB, NZDSFiber) with reference channels

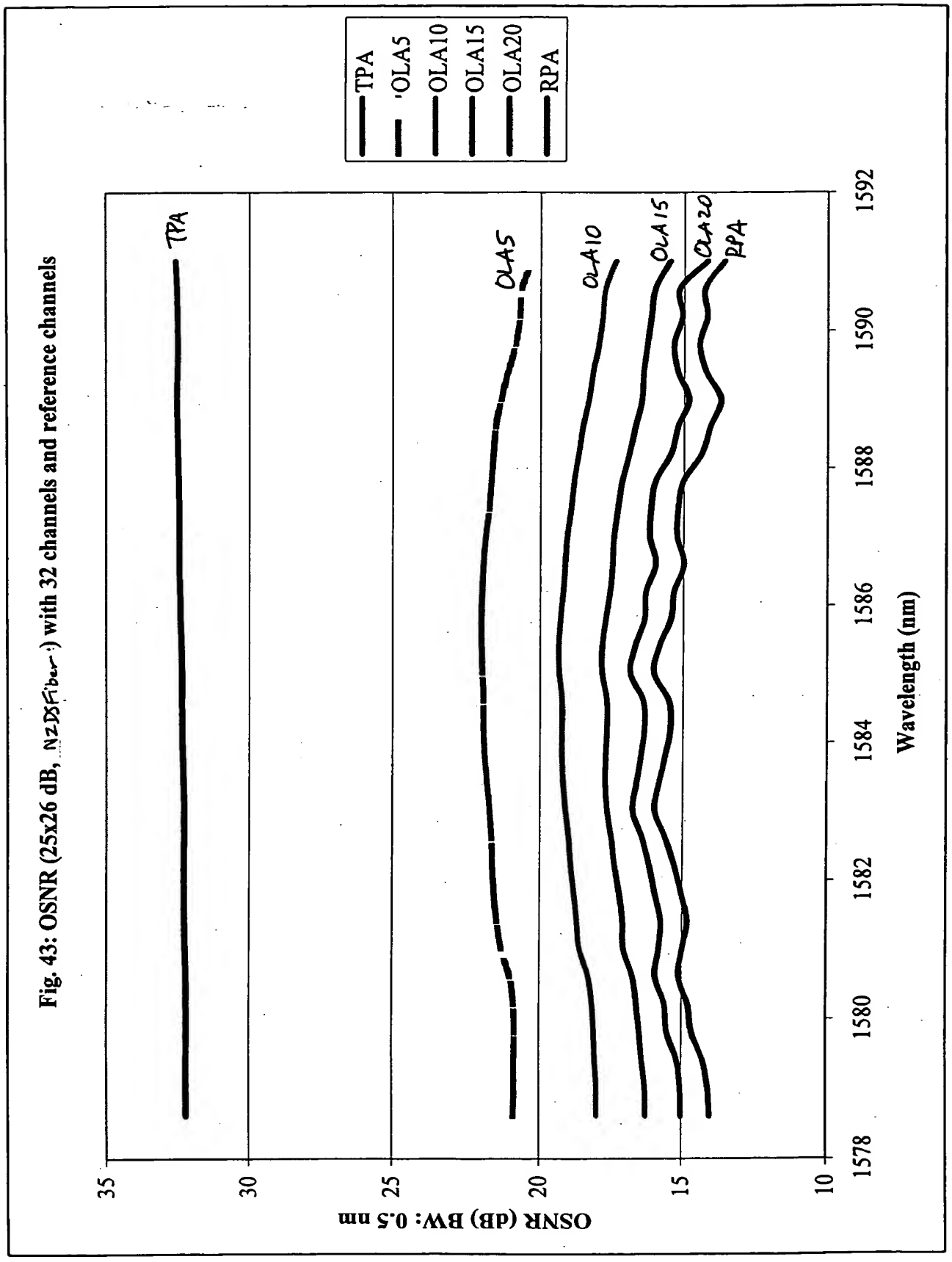


Fig. 43: OSNR (25x26 dB, NZDSFiber) with 32 channels and reference channels

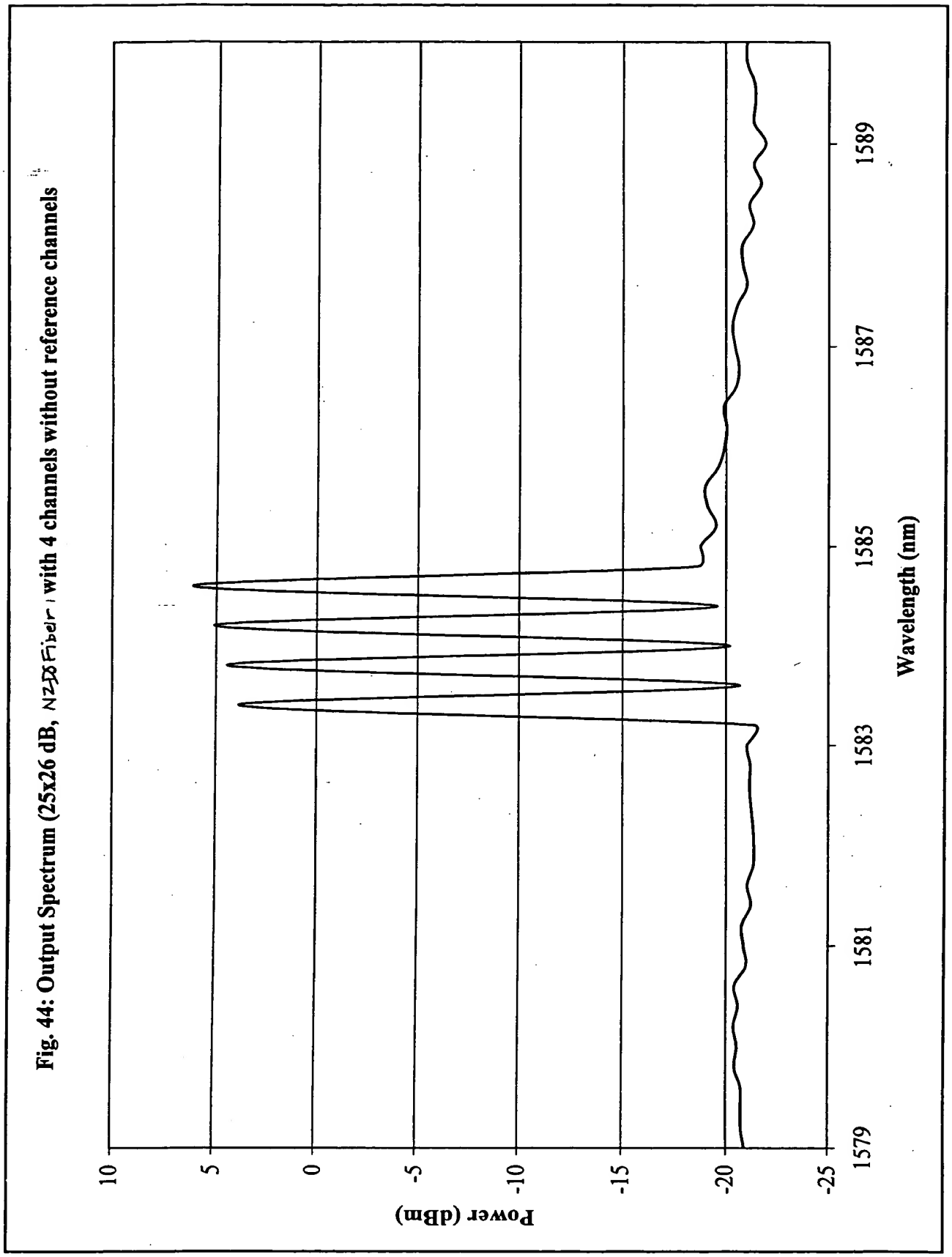


Fig. 44: Output Spectrum (25x26 dB, NZDFiber) with 4 channels without reference channels

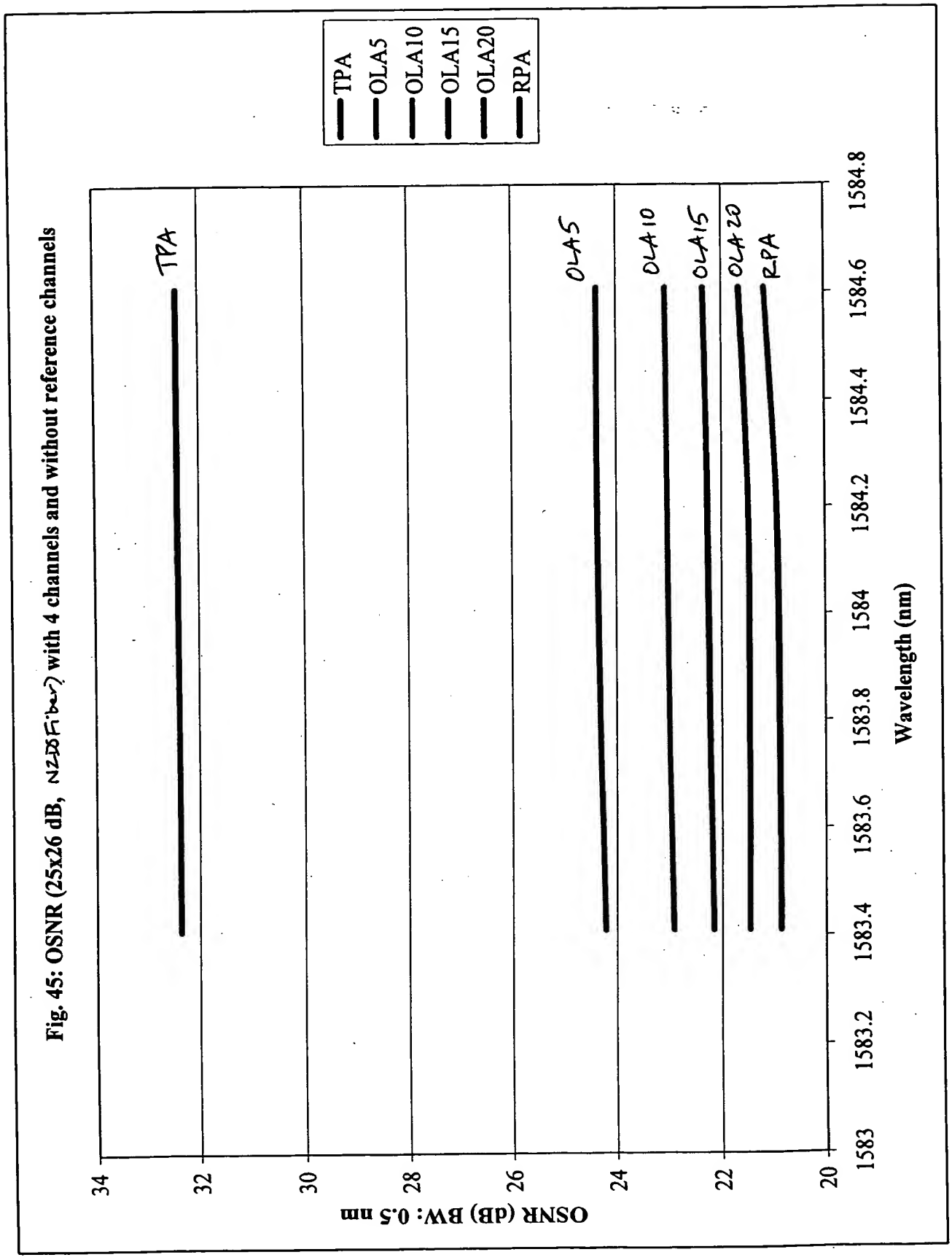


Fig. 45: OSNR (25x26 dB, NZDFiber) with 4 channels and without reference channels

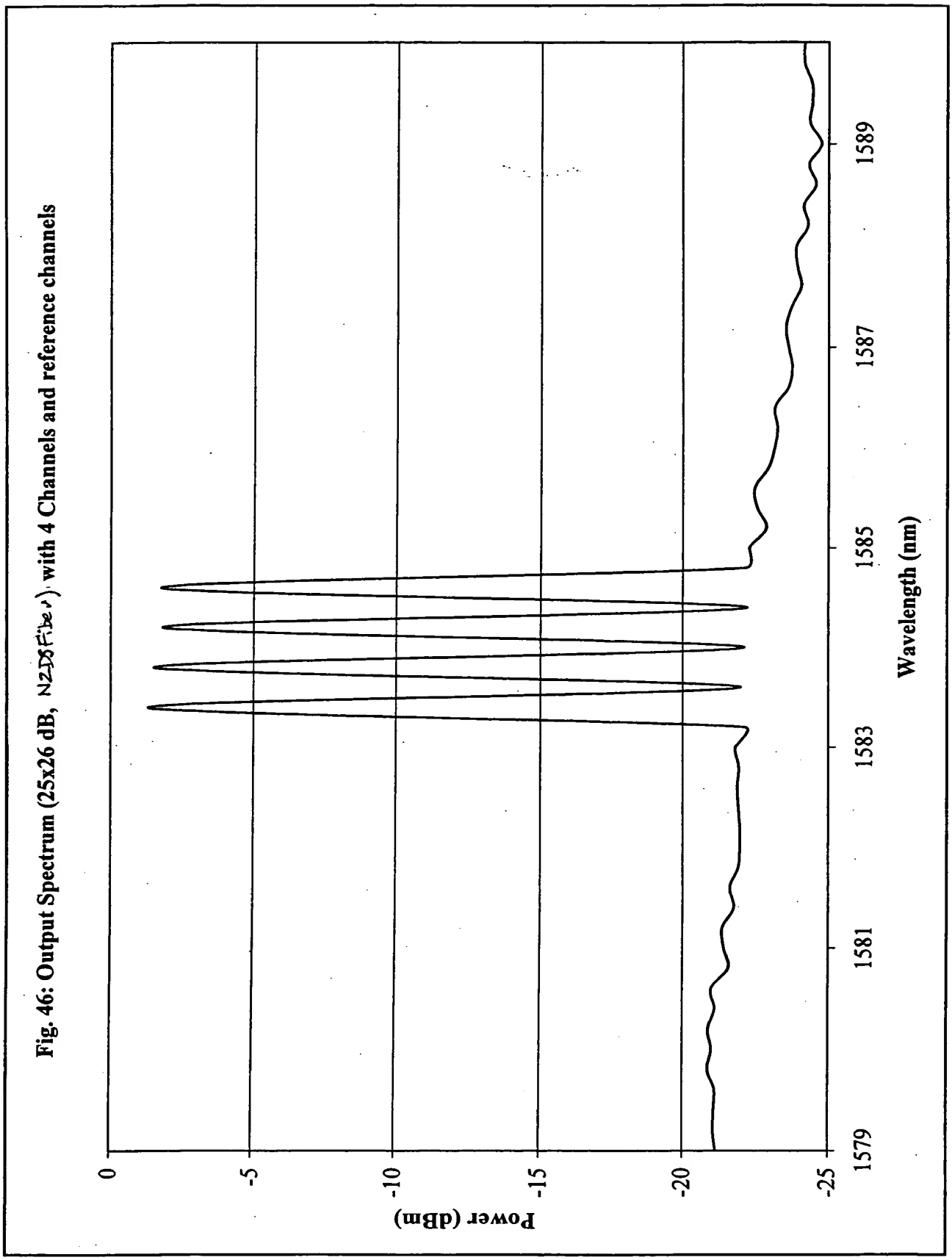


Fig. 46: Output Spectrum (25x26 dB, NZDFiber) with 4 Channels and reference channels

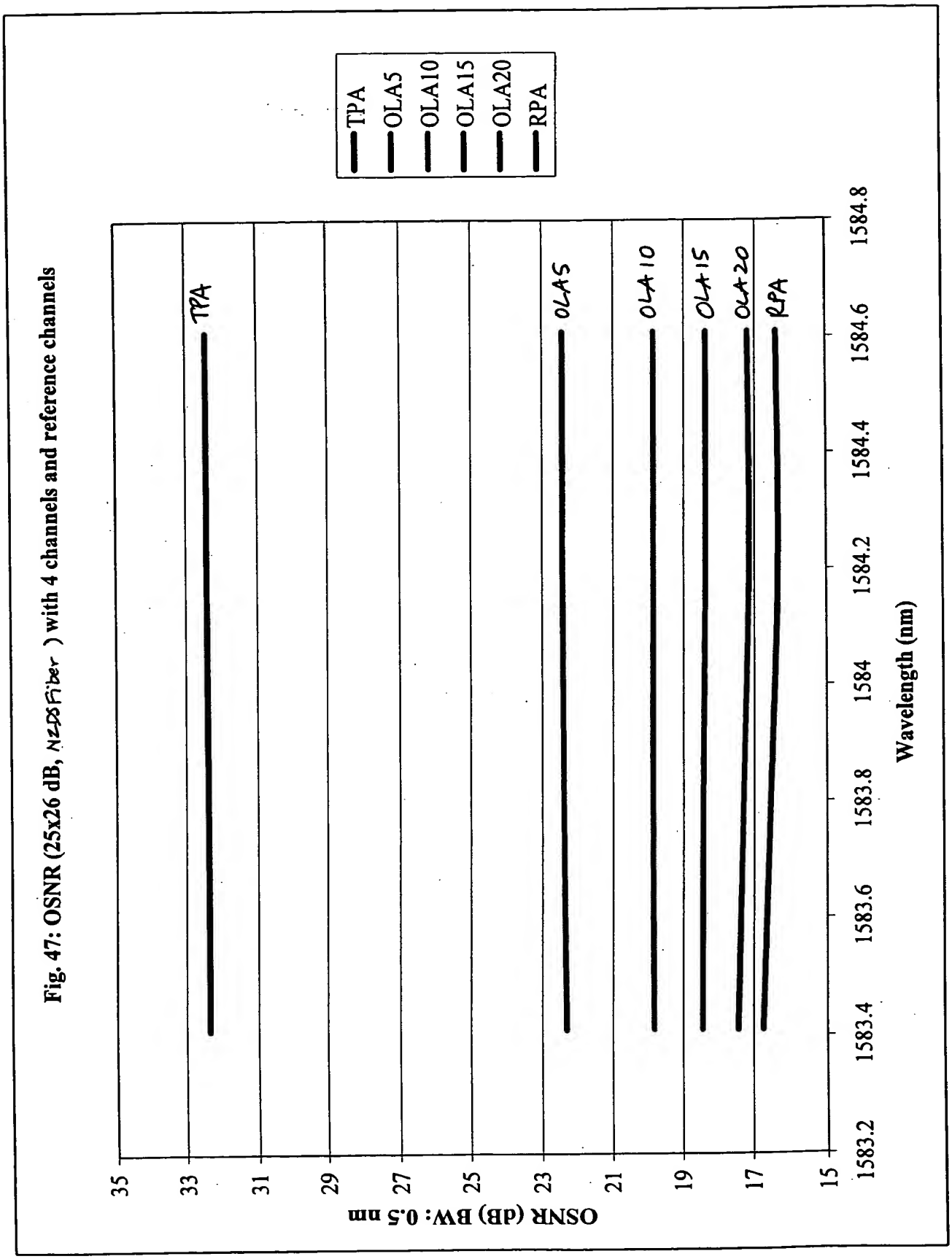


Fig. 47: OSNR (25x26 dB, NZDSFiber) with 4 channels and reference channels

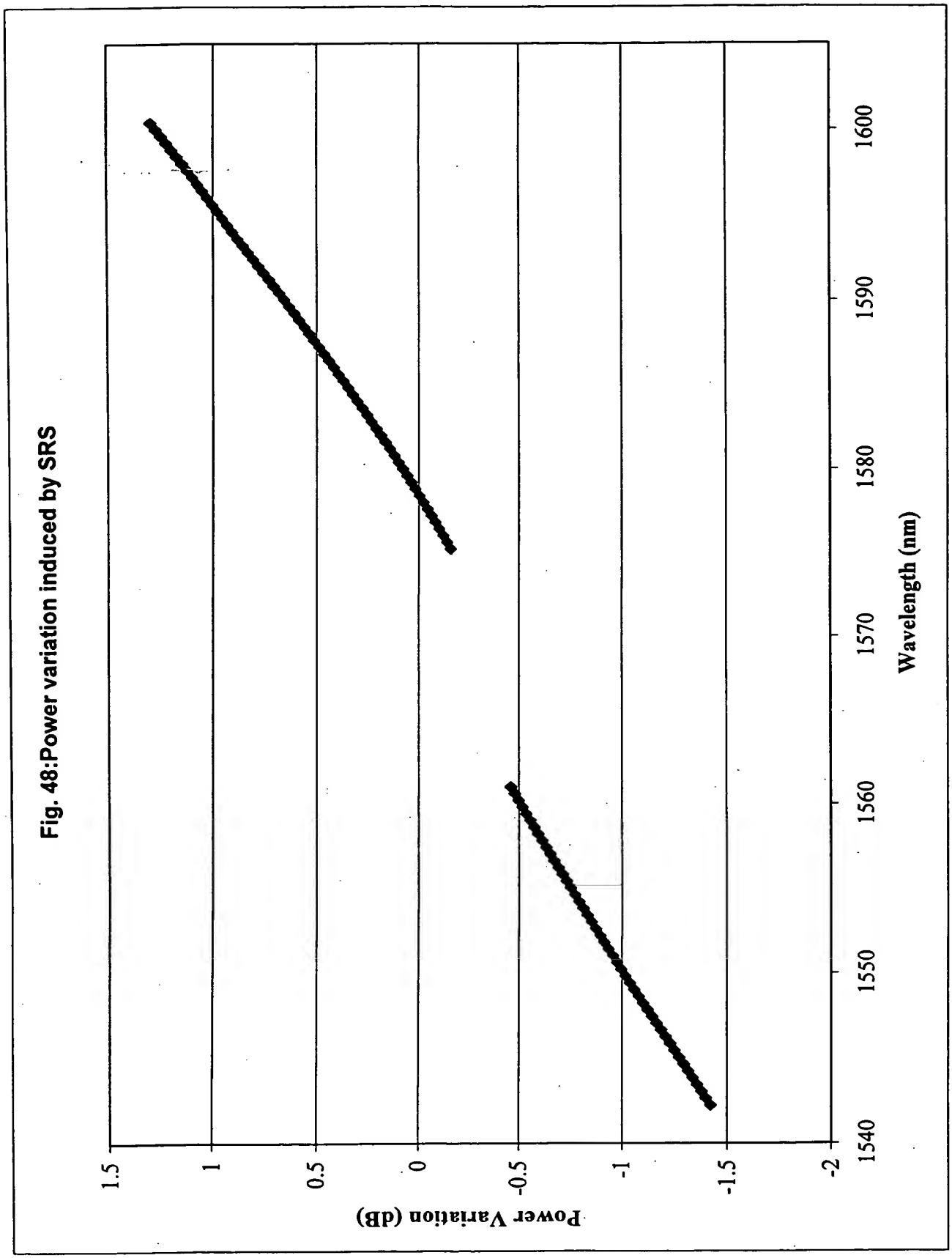


Fig. 48:Power variation induced by SRS

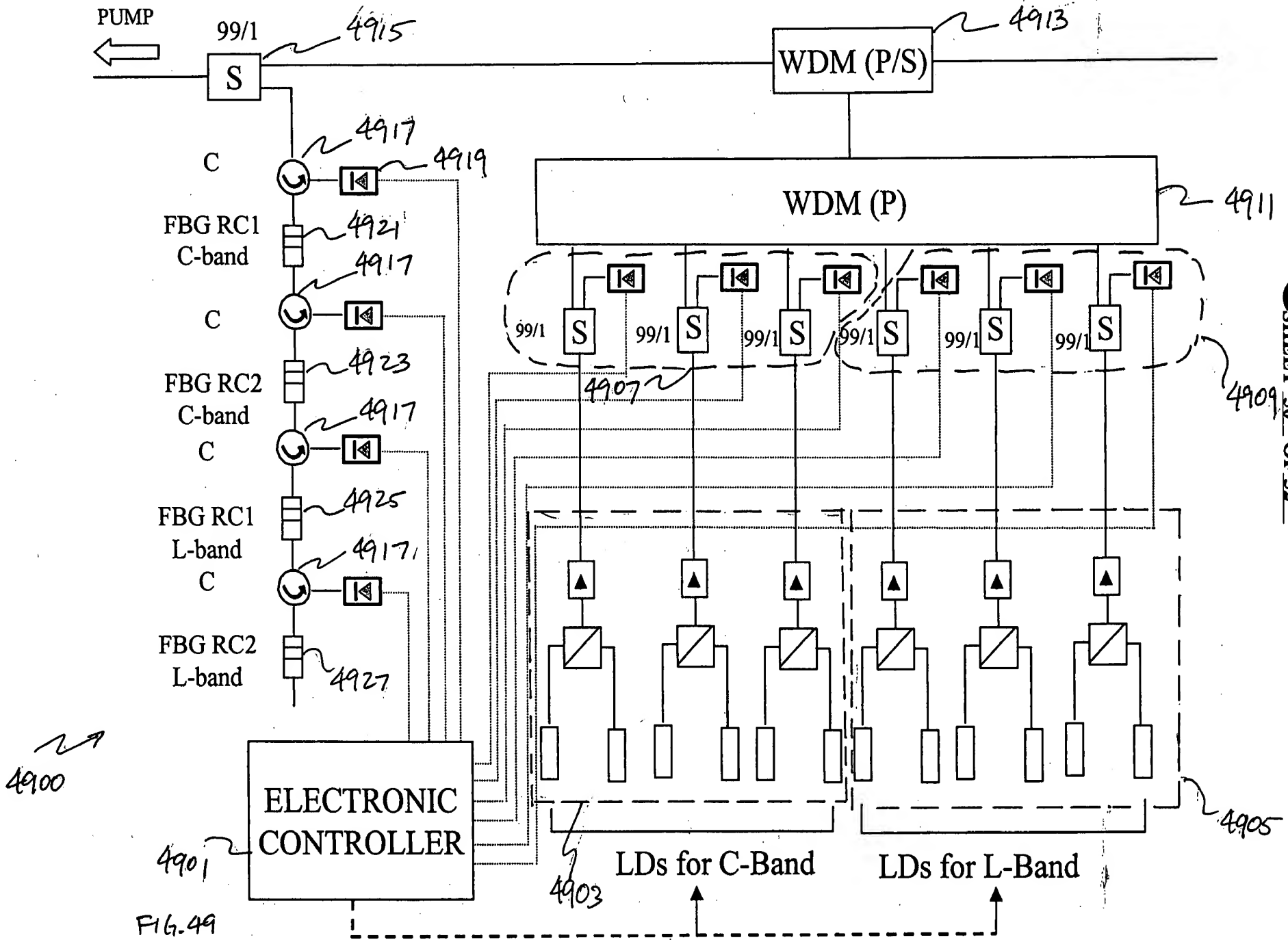


FIG. 49

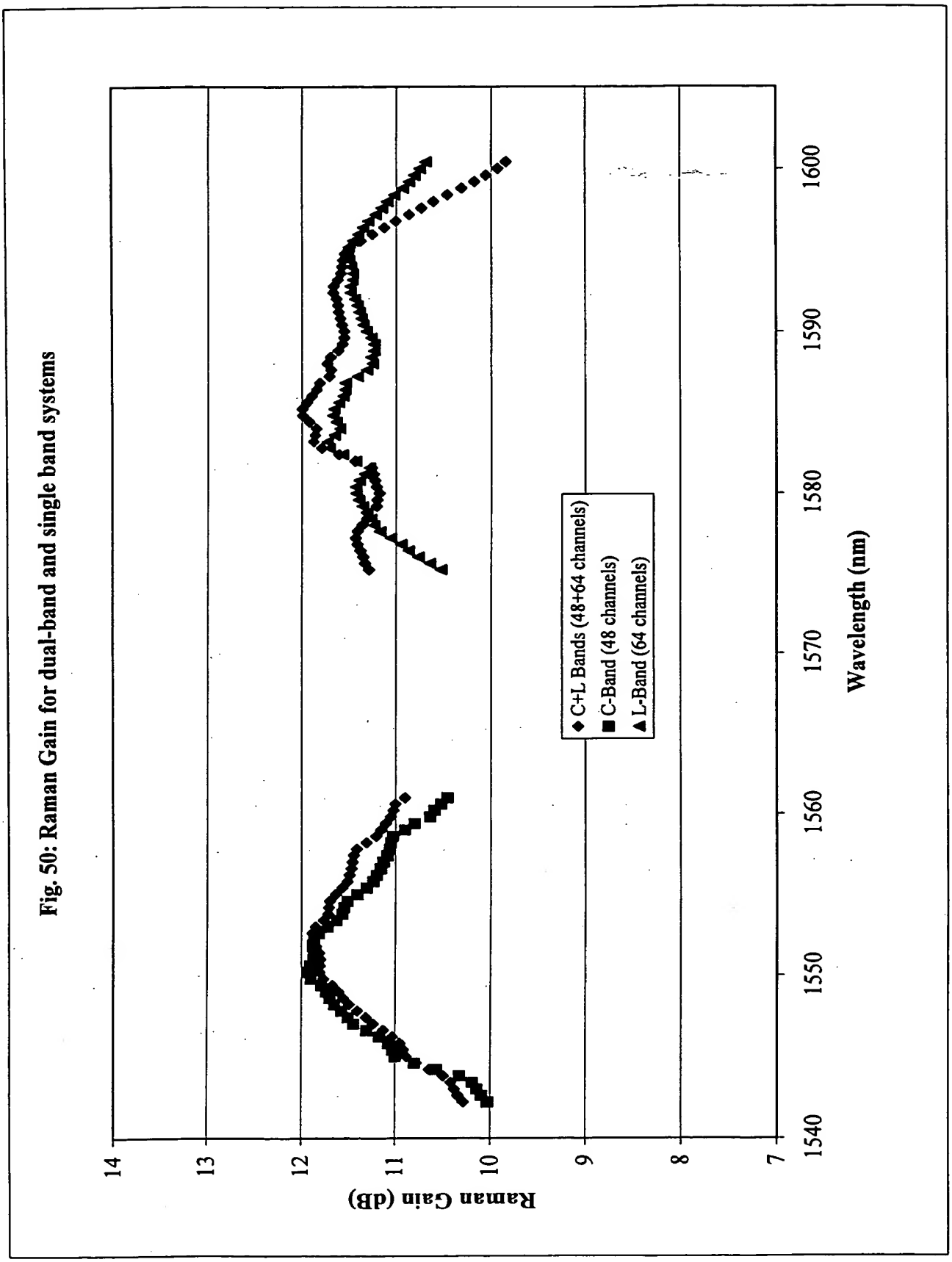


Fig. 50: Raman Gain for dual-band and single band systems

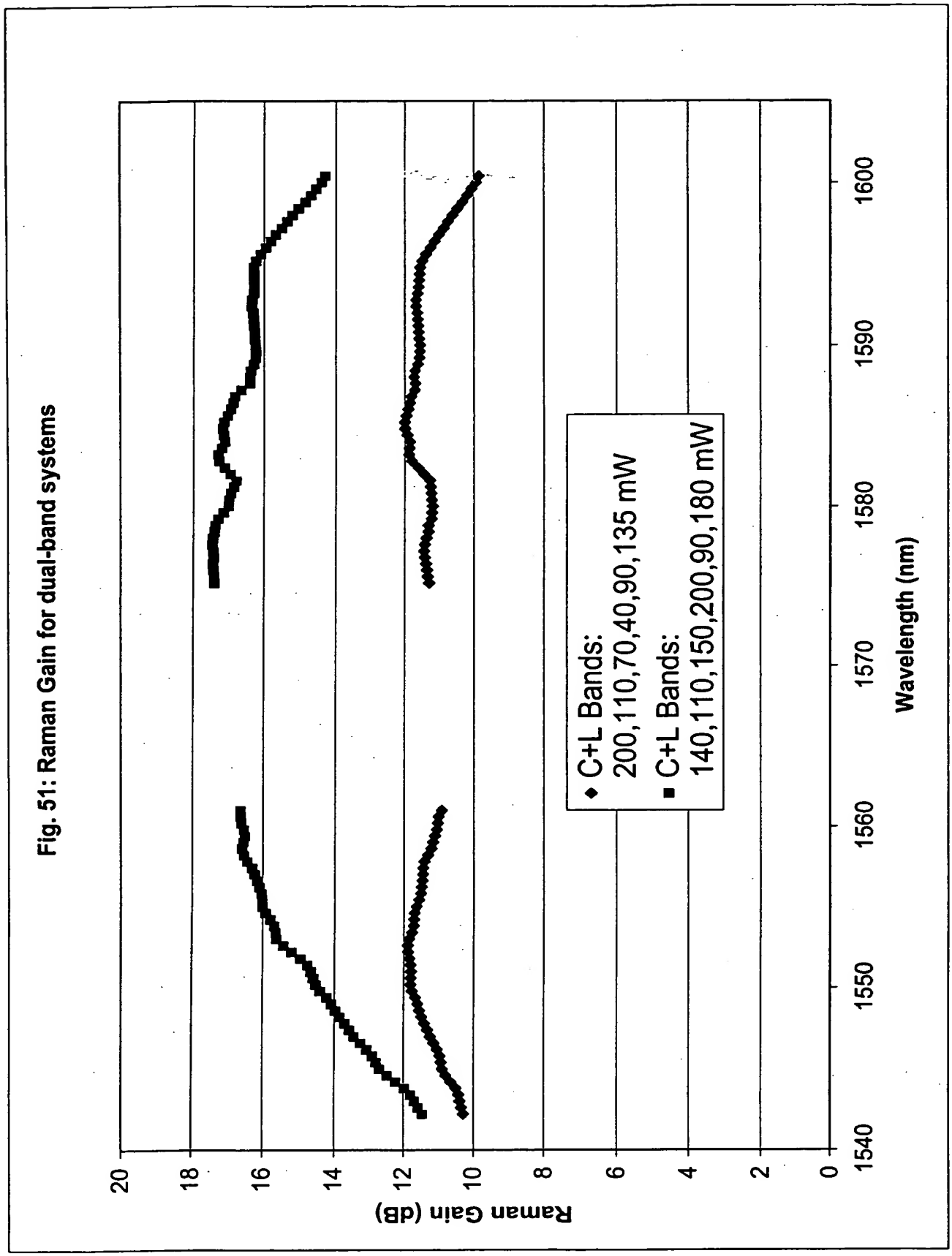


Fig. 51: Raman Gain for dual-band systems